DOCUMENT RESUME

ED 427 894 PS 027 409

TITLE	Investing in Our Future: A National Research Initiative for America's Children for the 21st Century.
INSTITUTION	Office of Science and Technology Policy, Washington, DC. National Science and Technology Council.
PUB DATE	1997-04-00
NOTE	95p.
AVAILABLE FROM	Office of Science and Technology Policy, Science Division, Washington, DC 20502; Tel: 202-456-6130; Fax: 202-456-6027; Web site: http://www.whitehouse.gov/WH/EOP/OSTP/html/OSTP_Home.html
PUB TYPE	Reports - Research (143)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Adolescents; Agency Cooperation; Change Strategies; *Child Development; Childhood Needs; Children; *Government Role; *Public Policy; *Research; Research Needs; Social Indicators
IDENTIFIERS	National Science and Technology Council; Public Private Partnership Programs; Service Providers

ABSTRACT

In 1996, under the coordination of the National Science and Technology Council's (NSTC) Children's Initiative subcommittee, 23 federal agencies involved in child and adolescent research programs came together to examine the federal investment in research focused on the biological, cognitive, and social development of America's children. This report provides starting points for the Federal Government over the next few years as it evaluates the research investments to be made on key issues affecting the health, education, and well-being of children and youth. The report urges strengthening the use of research findings to inform policy and program development and for establishing productive partnerships among public and private sectors. Following an executive summary and an overview, the report is organized into four sections. Section 1, "Snapshot of the Federal Research Portfolio," briefly describes the current federal investment in research on children and adolescents. Section II, "Gaps in the Knowledge Base: Examples of Research Opportunities," provides examples of research needs in understanding children's development, and a basis for establishing research priorities. Section III, "A Key Element of the Research Enterprise: Links to Policymakers and Service Providers," discusses the need for establishing stronger links among researchers, policymakers, and service providers to develop policies and programs that meet the needs of children and adolescents. The concluding section, "Next Steps: Options for Phase Two of the Children's Initiative," provides recommendations for building on the work of this first phase. Four appendices include a list of the Children's Initiative committee and staff; the methodology for assessing the federal investment in research; a 42-item bibliography; and examples of successful research-policy or research-linkages submitted by federal agencies. (HTH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

PS

Investing in Our Future

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED 427 804

A NATIONAL RESEARCH INITIATIVE

FOR AMERICA'S CHILDREN

FOR THE 21ST CENTURY

NATIONAL SCIENCE AND

TECHNOLOGY COUNCIL

COMMITTEE ON

FUNDAMENTAL SCIENCE

COMMITTEE ON HEALTH, SAFETY, AND FOOD

PS 022109

April 1997

Executive Office of the President
Office of Science and Technology Policy

BEST COPY AVAILABLE

About the National Science and Technology Council

President Clinton established the National Science and Technology Council (NSTC) by Executive Order on November 23, 1993 and he serves as Chairman. This Cabinet-level council is the principal means for the President to coordinate science, space and technology policies across the Federal Government. The NSTC acts as a "virtual" agency for science and technology to coordinate the diverse parts of the Federal research and development enterprise. Membership consists of the Vice President, Assistant to the President for Science and Technology, Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other White House officials.

An important objective of the NSTC is the establishment of clear national goals for Federal science and technology investments in areas ranging from information technologies and health research to improving transportation systems and strengthening fundamental research. The Council prepares research and development strategies that are coordinated across Federal agencies to form an investment package that is aimed at accomplishing multiple national goals.

To obtain additional information contact the NSTC Executive Secretariat at (202) 456-6100.

About the Office of Science and Technology Policy

The Office of Science and Technology Policy (OSTP) was established by the National Science and Technology Policy, Organization and Priorities Act of 1976. The OSTP's responsibilities include advising the President in policy formulation and budget development on all questions in which science and technology are important elements; articulating the President's science and technology policies and programs; and fostering strong partnerships among Federal, State and local governments, and the scientific communities in industry and academe.

Investing in Our Future

A NATIONAL RESEARCH INITIATIVE

FOR AMERICA'S CHILDREN

FOR THE 21ST CENTURY

4

THE WHITE HOUSE

WASHINGTON

April 17, 1997

Dear Colleague:

I am pleased to introduce the National Science and Technology Council (NSTC) report, Investing in Our Future: A National Research Initiative for America's Children for the 21st Century. Produced by a multi-agency working group under the direction of the NSTC Committees on Fundamental Science and Health, Safety, and Food, this report assesses the current scope of Federal research on child and adolescent development, identifies significant needed research, and makes recommendations for efforts not only in research, but also in linking research and policy development.

By increasing the attention of our Nation's creative and thoughtful research scientists on the needs of children, we can enhance the likelihood that when today's children become the adults of the 21st century, they will be the healthiest, safest, best educated, most productive and creative generation this Nation and the world have ever seen.

The subcommittee's co-chairs, Drs. Duane Alexander of the National Institutes of Health, and Lynn Goldman of the Environmental Protection Agency, and other members of the multi-agency group are to be commended for their efforts on this report.

Sincerely,

John H. Gibbons

Assistant to the President
for Science and Technology

Committee on Fundamental Science

Dr. Neal Lane
Co-Chair, Director
National Science Foundation

Dr. Harold Varmus
Co-Chair, Director
National Institutes of Health

Dr. Ernest J. Moniz*
White House Co-Chair
Associate Director for Science
Office of Science and Technology Policy

Dr. Clifford J. Gabriel
White House Co-Chair
Acting Associate Director for Science
Office of Science and Technology Policy

Executive Secretary

Dr. Judith Sunley
Assistant to the Director
National Science Foundation

Members

Dr. Marshall S. Smith
Acting Deputy Secretary
Department of Education

Dr. Elkan Blout
Senior Advisor for Science
Food and Drug Administration

Dr. Wesley T. Huntress, Jr.
Associate Administrator
Office of Space Science
National Aeronautics and Space Administration

Dr. Martha Krebs
Director for Energy Research
Department of Energy

Dr. Thomas E. Lovejoy
Assistant Secretary for Environmental and External Affairs
Smithsonian Institution

Mr. George C. Koch
Technology Advisor
Office of the Assistant Secretary for Employment and Training
Department of Labor

Dr. Bonnie McGregor
Programs Associate Director
U.S. Geological Survey

*Resigned January 31, 1997

Dr. T.J. Glauthier
Associate Director
Natural Resources, Energy, and Science
Office of Management and Budget

Dr. Anita K. Jones
Director
Defense Research and Engineering
Department of Defense

Dr. Catherine E. Woteki
Acting Under Secretary
Research, Education, and Economics
U.S. Department of Agriculture

Dr. Peter Preuss
Director
National Center for Environmental Research
and Quality Assurance
Environmental Protection Agency

Dr. Fenton Carey
Associate Administrator for
Research, Technology, and Analysis
Research and Special Programs
Administration
Department of Transportation

Dr. Alfred M. Beeton
Acting Chief Scientist
Office of the Chief Scientists
National Oceanic and Atmospheric
Administration

Mr. John Feussner
Chief Research Development Officer
Department of Veterans Affairs

Committee on Health, Safety, and Food

Dr. Philip R. Lee*
Chair, Assistant Secretary for Health
Department of Health and Human Services

Dr. Jo Ivey Boufford
Chair, Acting Assistant Secretary for Health
Department of Health and Human Services

Dr. Catherine E. Woteki
Vice-Chair, Acting Under Secretary
Research, Education, and Economics
U.S. Department of Agriculture

Dr. David A. Kessler**
Vice-Chair, Commissioner
Food and Drug Administration

Dr. Michael A. Friedman
Vice-Chair, Lead Deputy Commissioner
Food and Drug Administration

Dr. Ernest J. Moniz ***
White House Co-Chair
Associate Director for Science
Office of Science and Technology Policy

Dr. Clifford J. Gabriel
White House Co-Chair
Acting Associate Director for Science
Office of Science and Technology Policy

Executive Secretary

Dr. Dalton G. Paxman
Department of Health and Human Services

Members

Dr. Wendy Baldwin
Deputy Director for Extramural Research
National Institutes of Health

Dr. Lynn Goldman
Assistant Administrator
Office of Prevention, Pesticides and Toxic Substances
Environmental Protection Agency

Dr. Claire Broome
Deputy Director
Centers for Disease Control and Prevention
Department of Health and Human Services

Dr. Mary E. Clutter
Assistant Director
Directorate for Biological Sciences
National Science Foundation

Dr. Nils M. Daulaire
Deputy Assistant to the Administrator
U.S. Agency for International Development

Dr. Arnauld Nicogossian
Acting Associate Administrator for Life and Microgravity Sciences and Applications
National Aeronautics and Space Administration

* *Resigned January 31, 1997*
** *Resigned February 28, 1997*
*** *Resigned January 31, 1997*

Dr. Joseph Osterman
Director, Environmental Life Sciences
Department of Defense

Dr. Tara O'Toole
Assistant Secretary for Environment, Safety, and Health
Department of Energy

Dr. Kailish Gupta
Medical Officer
Directorate for Health Sciences
Consumer Product Safety Commission

Dr. Judith Heumann
Assistant Secretary
Office of Special Education and Rehabilitative Services
Department of Education

Dr. Richardo Martinez
Administrator
National Highway, Traffic, and Safety Administration
Department of Transportation

Mr. Rolland Schmitten
Assistant Administrator for Fisheries
Department of Commerce

Dr. Raymond Sphar
Associate Chief Medical Director for Research and Development
Department of Veterans Affairs

Mr. Richard Turman
Chief, Health Programs and Services Branch
Office of Management and Budget

Table of Contents

Executive Summary 3

Overview 9

I. Snapshot of the Federal Research Portfolio 19

II. Gaps in the Knowledge Base:
Examples of Research Opportunities 25

III. A Key Element of the Research Enterprise:
Links to Policymakers and Service Providers 47

IV. Next Steps: Options for Phase Two of the
Children's Initiative 53

Endnotes 57

Appendix A: Subcommittee on the Children's Initiative 59

Appendix B: Methodology 63

Appendix C: Selected Bibliography 67

Appendix D: Examples of Successful Research-Policy or
Research-Services Linkages Submitted by Agencies 71

Executive Summary

Preparing America's children for the 21st century is among our most important national priorities. Today's children face the promise of a new century of unparalleled opportunity in which new technologies, improvements in health, expanding economies, and other advances create the hope that their future will be the brightest of any generation in history. Yet, too many of them face obstacles that obscure that bright future, including poverty, violence, child abuse, limited educational opportunity, and unhealthy behaviors. The devastating economic, social, and human costs of these obstacles are indisputable. Addressing these challenges to their future and investing in opportunities so that all children can reach their full potential is a high priority of the Clinton Administration. An essential component of this strategy is undertaking research to provide new knowledge of ways to improve their futures and to provide sound guidance for policy makers to assure that efforts to help are likely to succeed.

Numerous indicators of the well-being of our children and families paint a mixed picture of successes and shortcomings. Our national infant mortality rate is declining rapidly and is at a record low, but is still higher than that of many other countries. Our children's test scores in reading and science are improving but still trail those of several other industrialized nations. Our school dropout rate is unacceptably high, costing over $250 billion

each year in lost earnings and foregone taxes, as well as lost human potential. Our teenage pregnancy rate is declining slightly, but is still the highest in the developed world. Our national vaccination coverage is the highest ever, but in many communities less than 50 percent of 2-year-olds are adequately immunized. A similar picture of gains and unmet goals exists with respect to youth violence, child poverty, smoking, and other substance abuse.

Much of the progress achieved in these and other areas is the result of critical research efforts that have advanced our understanding of how children and youths develop into healthy and productive individuals. Research has helped to inform policy decisions and program development, track outcomes, and identify strategies that work and those that do not. The Federal investment in research has clearly paid dividends in terms of improved outcomes for children and a healthier and brighter outlook for the entire Nation. Despite such important achievements, much remains to be done. Significant gaps persist in our understanding of how children grow up to be healthy, well-educated, and responsible members of society. Given the profoundly changing nature of our communities and Nation, strengthening the Federal research enterprise on child and adolescent development and expanding its role in shaping relevant policy are especially crucial to serving national goals.

The Children's Initiative Subcommittee

In May 1996, the National Science and Technology Council's (NSTC) Committee on Fundamental Science and Committee on Health, Safety, and Food formed the Children's Initiative Subcommittee to explore the Federal investment in research focused on the biological, cognitive, and social development of America's children. Representatives from 23 Federal agencies involved in child and adolescent research programs came together to examine the Federal investment in this area and to foster coordinated efforts. The major goals of the Subcommittee were to:

- Assess the size and scope of the Federal research portfolio on children and adolescents;
- Identify important research issues in children's biological, cognitive, and social development; and
- Strengthen research-policy linkages and develop a sustainable process for collaboration and communication of scientific knowledge about childhood and adolescence within the Federal Government.

The Federal Research Portfolio

In fiscal year (FY) 1995, all levels of government combined spent an estimated $500 billion on children and adolescents, almost two-thirds of which was devoted to K-16 education. Most of the remaining funds were allocated for social welfare including: Aid to Families with Dependent Children (AFDC), Medicaid, Head Start, the U.S. Department of Agriculture's (USDA) Special Supplemental Food Program for Women, Infants, and Children (WIC), and the Food Stamp Program; criminal justice (including police, courts, and prison expenditures); health care; and other programmatic expenses. Of this amount, approximately $2 billion, representing less than four-tenths of one percent of the total governmental expenditures on children and youth, was spent on research and development. The estimated $2 billion investment, less than 3 percent of the total Federal research enterprise, is aimed at understanding the growth and development of 30 percent of the Nation's population — over 80 million children and adolescents under age 21. In contrast to other areas where non-government sources provide the larger share of the investment in research, the Federal investment represents most of the research targeted toward children: private foundations add approximately $75 million to the total, and State and local governments a somewhat larger amount. These comparisons call into question whether the current Federal research investment related to child and adolescent health and development is consistent with Federal investments in research in other areas, and whether it is adequate to meet the need for informed policies and decision-making.

Important Research Issues and Opportunities

Although a great deal of knowledge about young people has been gained from past research in the social, behavioral, and life sciences, we clearly need to advance our understanding of what enables all children to grow up to be healthy and active members of society. As general themes, this research should focus on developmental processes beginning before birth and extending through adolescence; address the relationships among biological, cognitive, social, and emotional aspects of development; include racial and ethnic minority and non-minority

groups and address influences of families, peers, schools, communities, media, and other social institutions on development; and address enhancing positive outcomes rather than just treating negative ones. Within these themes, six examples of particularly important research opportunities were identified.

- *Health and Behavior.* With increasing recognition of the major impact of behavior on health, important research questions include what influences children to avoid or engage in risky and adverse behaviors, the nature of the health behavioral change process for children and youth, the cumulative effects of adverse and risky behaviors on child development, age group differences in health risk behaviors, influences of family and situational factors on health risk behaviors, how children and adolescents perceive the risks of engaging in health compromising behaviors, and what approaches would help them adopt health enhancing behaviors.

- *Children and Environmental Hazards.* With children facing a wide array of environmental threats to their health, it is important to learn how best to understand the health implications of these threats, understand the cumulative effects of hazardous substances, identify hazards that are particular threats to children, and learn when children are most vulnerable to these hazards.

- *Learning.* New knowledge about the brain processes involved in learning provides opportunities to study the relationships between learning and intelligence and creativity, the use of technology to nurture the ability of children to learn and create, the effects of multimedia technologies on children's development, and the role of nutrition in influencing ability to learn.

- *Influence of Families and Communities on Development.* Important questions include how children and families access community resources and find out about their availability, how communities can facilitate an adolescent's safe passage to adulthood, how changing families and communities are affecting children and adolescents, and how families and communities as well as children are being affected by major policy innovations taking place at all levels of government.

- *Longitudinal Studies.* Long-term follow-up studies of children provide the best means for assessing how child development in "normal" conditions compares to what occurs in adverse conditions, how families and social institutions can help children become economically productive adults, how childhood experiences affect later adult behavior and risks of chronic disease, and how childhood and adolescent interventions can be most effectively targeted to the childhood antecedents of adult disease to prevent or delay onset of problems in adult life. To achieve the latter objective, studies could address interventions during childhood to reduce the likelihood of osteoporosis, cardiovascular disease, obesity, injury, smoking, mental health problems, learning disabilities, AIDS, and other conditions.

- *Policy Research.* In this emerging field of research, important questions to address are the effects of variations in health care and welfare reform on children and families, the combined effect of policy changes on child well-being and service delivery, approaches to prevention and intervention that best foster health and well-being of children, and data sources needed to monitor change.

Linking Research to Policymakers and Service Providers

Knowledge gained through research on children can and should inform and facilitate action to solve our Nation's urgent and costly social and economic problems. But for Federal research to be used more effectively in policy and program development, researchers must improve the ways in which they communicate and disseminate important findings to decision-makers. The scientific research community must work to establish new links and strengthen existing ones with policymakers and service providers. Likewise, policymakers and service providers, for their part, must not only assist researchers to identify key research questions concerning children, youth, and families, but also must take responsibility for acting on relevant research findings. When successful, such connections can have powerful and beneficial results on children's well-being.

Given the complexity of influences on child and adolescent development, improved connections between researchers and those who develop policies and programs concerning the future of young people must be an essential part of the Federal research strategy. These connections should be thought of in terms of a continuing feedback system, with multiple entry points for feedback and modification in the decision-making process at the Federal, State, and local levels. Such a strategy would enable researchers not only to inform initial policy and program development, but also to monitor and evaluate the implementation of these policies and programs — and their effects on child, adolescent, and family status — on an ongoing basis. Sustained research could provide knowledge that is essential in our effort to further shape and refine policies and programs so that they more effectively address the problems facing our children and Nation.

Increased multi-agency collaboration and coordination of research on national priorities related to children's health, education, and well-being are essential steppingstones to success. Just as linkages should cut across public and private sectors and span all governmental levels, the Federal Government's collaborative approach should also strive to tap the knowledge and experiences of the private sector, including foundations and private industry. Strategic partnerships with interested public and private sources will be instrumental to addressing the current and emerging needs for relevant data and knowledge concerning children and adolescents.

A specific linkage issue is how the Federal research investment in child and adolescent development can be more effectively used to inform our Nation's domestic policy. Two fundamental questions are involved. The first is how to create and strengthen the linkage between two key councils within the Executive Office of the President — the NSTC (which coordinates the diverse parts of the Federal research and development enterprise) and the Domestic Policy Council (DPC) (which oversees the development and implementation of the President's domestic policy agenda), in a way that fosters important research and uses the results of that research to guide policy development. The second is how to use this linkage between NSTC and DPC to create effective collaboration among Federal agencies that support research on children and adolescents.

Recommendations for Next Steps

To meet this challenge, the Children's Initiative Subcommittee recommends that an Interagency Working Group (IWG), such as the Task Force established in the Executive Order Protection of Children from Environmental Health Risks and Safety Risks, identify activities within their research portfolios that support, inform, and facilitate the achievement of the Administration's key goals of ensuring the optimal health, education, and well-being of all American children and youth. The IWG's responsibilities should include, but not be limited to, the following:

- *Provide directly to the NSTC and DPC on an ongoing basis* — the results of Federal research activities that relate to these goals and have implications for policy.

- *Develop and implement a long-term strategic planning process* — to advance a multi-agency Federal R&D effort related to the optimal development of children and adolescents. This process should include the identification and recommendation of appropriate partnerships among public and private sector parties interested in ensuring the healthy and productive development of children and adolescents.

- *Identify key research investment opportunities regarding children and adolescents* — to achieve the overarching goals outlined in the strategic plan. These investment opportunities should highlight the need for and the benefits of a multi-agency, coordinated approach to scientific research concerning young people. The Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) would play an integral role in working with the IWG to develop a coordinated strategy, including budgetary issues, in which agencies can collaborate on research problems of national concern. These problems include strengthening the collection of reliable indicators of child and adolescent well-being and the research that provides us with knowledge of the factors that influence these indicators over time. A coordinated research strategy on optimal human development from early childhood into young adulthood, particularly on factors supporting learning, should be a high priority.

- *Identify mechanisms to strengthen research-policy linkages* — not only among NSTC, DPC, Federal agencies and State and local government, but also among relevant non-governmental organizations and other public and private sector parties at the national, regional, and community levels. Such extensive linkages are needed to ensure that research knowledge generated by Federal agencies and other entities is effectively used to shape policy and program development regarding children, youth, and families.

- *Consider appropriate means for conducting an external assessment of the IWG's work* — to ensure that the Federal Government's strategic plan and identification of key research investment opportunities, potential important partnerships, and mechanisms for strengthening research-policy linkages regarding children and adolescents are on target and effective.

Our Nation has a clear stake in ensuring that all of America's children grow up to be healthy, educated, productive, and contributing adults. Doing so requires removing barriers to achieving their full potential, including the barrier of insufficient knowledge. Scientific

research is, and will continue to be, a catalyst for achieving that goal; it serves as a fundamental tool to gain knowledge needed for informing, developing, implementing, and refining policies and programs that address the urgent needs of children and adolescents. As such, research must be at the forefront of the highest level of decision-making. The Federal Government is faced with an opportunity to embark on a path that will lead to creating and sustaining conditions that optimize human development. It is time to take that first step — to establish a coordinated multi-agency research approach that emphasizes partnerships among the public and private sectors and linkages between the research and policymaking communities. We owe our children, our families, and our Nation nothing less than this sound investment in our future.

Overview

Preparing America's children for the 21st century is one of the top priorities of President Clinton's second administration. Children growing up in America today face the promise of a new century-of unparalleled opportunity in which new technologies, improvements in health, expanding economies, broader educational opportunity, and other advancements create hope that their future will be the brightest of any generation in history.

At the same time, too many of our children, adolescents, and their families face obstacles that obscure that bright future, including poverty, violence, child abuse, inadequate education, and substance abuse. Addressing these challenges to their future and investing in opportunities to ensure that all children reach their full potential is a central priority of the Administration. The devastating economic and social costs of not responding to these challenges for both individuals and society are indisputable.

The Administration's commitment to children and youth was demonstrated in its first term. It launched a number of initiatives critical to children and youth, including increasing Head Start enrollment by almost 200,000 in 1997; curbing the sales and marketing of tobacco to children (the Children's Tobacco Initiative); reducing teen pregnancy rates; providing safer food and drinking water; and expanding opportunities for children to improve their skills, maximize their potential, and prepare for the 21st century workplace (the Educational Technology Initiative, the America Reads Initiative).

Due in part to these efforts and the President's commitment to "cherish our children and strengthen the American family,"[1] the Nation has taken some modest but significant steps toward addressing these daunting challenges. Progress in these areas must often be measured incrementally. Solutions and knowledge of their effects and influence often take years or even generations to emerge. Still, it is important to acknowledge our successes. For example:

Infant Mortality[2]

What We Have Accomplished

The infant mortality rate reached a record low of 7.5 infant deaths per 1,000 live births in 1995, a 6 percent decrease from the previous year.

Challenges that Remain

The U.S. still has one of the highest infant mortality rates of any developed country; in some urban areas it exceeds some developing countries. From 1985 to 1994, the rate of low-birth-weight babies steadily increased. Low-birth-weight infants account

BEST COPY AVAILABLE

for nearly two-thirds of all deaths under 28 days of age; those babies who survive are at increased risk of suffering severe physical and developmental complications.

Education[3]

What We Have Accomplished

American fourth graders outperformed students from all other nations, except Finland, in the latest International Assessment of Reading, while American eighth graders have demonstrated rising math and science scores in recent years.

Challenges that Remain

Despite our national goal of being first in the world in math and science by the year 2000, U.S. eighth graders scored below the average of 41 countries in the math portion of the 1995 Third International Mathematics and Science Study (TIMSS). In science, students in nine countries outperformed U.S. eighth graders. In 1994, 40 percent of fourth graders failed to attain the basic reading level, while 70 percent did not attain the proficient level (e.g., competency with challenging reading materials). Poor reading performance is an important predictor of school dropout. Each year's class of dropouts will, over the course of its lifetime, cost the Nation about $260 billion in lost earnings and foregone taxes, in additional to lost human potential.

Teen Pregnancy[4]

What We Have Accomplished

The teen birth rate declined in 1995 for the fourth straight year, while the unmarried birth rate has decreased for the first time in nearly 2 decades.

Challenges that Remain

The teen birth rate is still higher than it was 20 years ago and the U.S. rate remains the highest in the developed world. Every year about 1 million adolescents become pregnant, most of whom are unmarried teens.

Immunization[5]

What We Have Accomplished

In 1995, three-quarters of all 2-year-olds were fully immunized — a historic high. The incidences of *Haemophilus influenzae type b* invasive disease, symptomatic hepatitis B, and measles among infants in the highest-incidence groups have been reduced by over 95 percent.

Challenges that Remain

Vaccine coverage among the economically disadvantaged in inner-city areas is about 50 percent. Public health measures require an immunization rate of 80 to 90 percent of all children to prevent the spread of outbreaks (see box on next page).

Immunization

One of the greatest public health success stories for children is development of vaccines against the infectious diseases of childhood.

NIH- and FDA-supported research has led to the creation of important vaccinations that have been instrumental in reducing childhood illness. For example, *Hemophilus influenzae type b* meningitis used to infect 15,000 children yearly, and was the leading cause of acquired mental retardation in the United States. The vaccine these agencies developed has nearly eliminated the disease in just 6 years.

NIH serves as the lead agency within the Public Health Service on the Children's Vaccine Initiative, a global effort launched in 1990 to accelerate the development of safe, inexpensive, orally administered vaccines. Work is under way on redesigning existing vaccines and developing new vaccines against rotavirus diarrhea, pneumococcus, meningococcus, Shigella dysentery, and other diseases.

CDC research showed that linking immunization services with WIC clinics could significantly increase immunization coverage of low-income children. In 1994, CDC and USDA developed a coordinated strategic plan to improve the immunization and general health status of WIC participants under 2 years of age. CDC also helped to develop immunization registries, a critical tool to achieve the National Goal for the Year 2000 of having at least 90 percent of 2-year-old children fully up-to-date with their recommended immunizations. We are now at the highest levels of immunization of children in the Nation's history.

Youth Violence[6]

What We Have Accomplished

The juvenile crime arrest rate decreased approximately 3 percent in 1995, while the juvenile murder arrest rate dropped more than 15 percent, marking the largest 1-year decrease in more than a decade.

Challenges that Remain

Our Nation can do better. In 1995, the cost of maintaining our prison system reached about $50 billion; in some States, prison system costs exceed the cost of supporting the State's higher education system. It is less costly to educate than to incarcerate.

Child Poverty[7]

What We Have Accomplished

Since 1993, the child poverty rate has declined from approximately 23 percent to 21 percent — the biggest 2-year drop since 1968. And with the recently passed Personal Responsibility and Work Opportunity Reconciliation Act of 1996, the stage is set for a fundamental reconstruction of the welfare system, giving States increased flexibility to move families off welfare.

Challenges that Remain

Much more progress is needed to reduce poverty. Children living in poverty are frequently inadequately nourished, live in overcrowded

Overcoming Adversity: It Can Be Done[8]

What enables some children to flourish in the face of adversity, while others experience significant setbacks? Despite many obstacles, many go on to become healthy, well-adjusted, productive adults.

A 3-decade, continuing longitudinal study of all children born on the island of Kauai, Hawaii, provides important insights into what makes children resilient in the face of adverse conditions they experience while growing up. Of the children designated as "high risk" because they were born into chronic poverty, had experienced perinatal stress, and lived in families plagued by conflict, divorce, alcoholism, or mental disorders, one-third did not develop problems during childhood or adolescence. This "vulnerable, but resilient" group of children emerged as competent young adults who were gainfully employed, involved in stable relationships, and active in their communities.

Three clusters of protective factors distinguished this group from the other two-thirds who did develop problems by adolescence. The results of the Kauai study and more than 250 other studies of children growing up in adverse circumstances present a consistent picture of the common factors that enable young people to beat the odds:

- Temperamental characteristics and social skills, which involve family members and others, and at least average intelligence. Individuals who achieve social competence, including life skills, are much more likely to flourish as adults, regardless of the conditions in which they grew up. More children, especially those in high-risk situations, must be provided with various opportunities to develop the competence and skills they need to succeed.

- Strong attachments with parents or parental substitutes, including grandparents, kin, and siblings. The commitment of nurturing, competent adults is crucial in a child's life. This has important implications not only for the role that mentors, tutors, and other adults can play in helping shape the successful development of children and adolescents, but also for efforts to increase opportunities for young people to develop close relationships with such adults.

- A vital community support system such as a church, youth group, or school that offers stable support and consistent guidance. Community and social institutions have a special opportunity to help children and youth foster healthy lifestyles. Yet, for many young people, these kinds of support systems simply do not exist in their neighborhoods; even those who do have access to such institutions often feel alienated or disconnected from them. More needs to be learned about how to tap the underlying potential of community institutions and how they can be more supportive of children and youth.

and unsafe environments, and experience academic underachievement, violence, and greater unemployment of adult family members.

Smoking and Substance Abuse[9]

What We Have Accomplished
Beginning in the early 1980s, the number of teens who smoked, used marijuana, or consumed alcohol declined or remained flat — for about a decade.

Challenges that Remain
While use has not returned to peak levels of the 1970s, teenage tobacco and drug use has continued to climb over the last several years, and alcohol use remains unacceptably high. More than 5 million of today's underage smokers will eventually die because of tobacco-related illnesses and if current patterns of teen smoking persist, their health needs will cost about $200 billion in health care alone. Alcohol and drug use is a major factor in injuries — in particular, motor vehicle injuries, which are the leading cause of death for persons every age from 6 to 27 years, again exceeding rates for every other developed country.

Alcohol-Impaired Driving

What We Have Accomplished
Young drivers age 15 to 20 have historically represented a high risk group, involved in more fatal crashes per licensed driver than drivers of any other age group. Alcohol has been a major factor in these fatal crashes. Efforts to reduce the alcohol-related fatal crash rate for young drivers have proven successful: from 1982 through 1995 these fatalities for young drivers declined by 59 percent, while adult alcohol-related fatalities dropped by 28 percent.

Challenges that Remain
While this is good news, other reports are disturbing. How long can this decline continue when drinking and drug use are on the rise? Even if the current rate holds, population increases among adolescent drivers will mean increased fatalities in coming years. Zero tolerance laws for underage drinking drivers and more active enforcement of underage drinking laws are essential. We need to support efforts by various sectors of the community and young people themselves to curb underage drinking and impaired driving.

Research Efforts

Much of the progress achieved in these and other areas is grounded in critical research efforts that have advanced our understanding of how children and youth grow into healthy and productive adults. Research has helped to inform policy decisions and program development, track outcomes, and identify strategies that work and those that do not. The Federal investment in research has clearly paid dividends in terms of improved outcomes for children and a healthier and brighter outlook for the Nation as a whole.

Consider, as examples, the pivotal role research has played in the development of early childhood education, the reduction and prevention of childhood lead exposure, the reduction and prevention of childhood injuries and iron deficiency anemia, the identification of protective factors that help children overcome adverse conditions such as poverty, and the understanding of how child nutrition contributes to health and educational attainment (see boxes in this section).

Early Childhood Programs: They Can Make a Difference[10]

Each day, some 13 million children attend early childhood programs such as preschool, Head Start, pre-kindergarten, nursery school, and child care programs. The role of children's experiences in these programs in shaping their developmental outcomes can no longer be ignored. The long-term prospects for most children depend to a great extent on what happens to them during their early years.

For 3 decades, researchers have documented the many practices that have been shown to foster learning among children. Research on experimental early childhood programs in the early 1960s, followed by Head Start in the mid-1960s, led to increased public understanding about the importance of such programs. As the research body of knowledge grew, so did evidence showing that quality early childhood programs result in long-term educational and economic gains — including higher reading scores, reduced likelihood of being held back a grade or placed in special education, increased chances of graduating from high school and likelihood for employment.

Since the 1960s, research in the developmental neurosciences has produced compelling evidence of the importance of the first 3 years on brain development. Research indicates that a child's social and cultural environment affects not only the number of brain cells and connections among them, but also the way these connections are "wired." Scientific findings document the positive impacts of being raised in a healthy, caring, nurturing environment, as well as the negative impacts of inadequate stimulation and impoverished surroundings. The Ypsilanti Perry Preschool Project of High/Scope, a well-known longitudinal study of low-income, African American children enrolled in preschool, reported significant short- and long-term gains in the children's school achievement, health, social adjustment, and economic prospects. The study, which began in 1962 and continued into 1996, concluded that a high-quality preschool program creates the foundation for adult success. A solid body of similar longitudinal research on high-quality early childhood programs for low-income children in different parts of the country supports these findings.

Recognition of the school readiness and possible longer term benefits that good early childhood experiences can provide to youngsters has prompted a growing public investment in early childhood programs. Today, Federal and State Governments invest about $10 billion annually in early childhood programs. Still, less than half of all 3- to 5-year-olds with family incomes of $40,000 or under were enrolled in preschool in 1995, compared with 82 percent of children from families whose annual incomes were more than $75,000.

Since most of these studies began in the 1960s and 1970s, what remains to be seen is whether such programs can still produce similar advantages for today's young people, given the changing nature of families and communities. Continued research on the impact of early childhood programs is needed to advance our understanding of the long-term outcomes.

Despite such important achievements, the Federal emphasis on research must be sustained. There continue to be significant gaps in our understanding of how children grow up to be healthy, well-educated, and responsible members of their communities and Nation.

The United States is experiencing significant changes in the racial and ethnic diversity of its population, fundamental shifts in the structure of families, and an increasingly global economy that demands a highly skilled workforce to achieve an adequate standard of living. At the same time, our society is undergoing changes in longstanding social policies; these changes include the devolution of responsibility for income support programs (e.g., welfare) from Federal to State Governments and the restructuring of our health care financing system. Our Nation has learned how to invest in and profit from research; now we must extend those efforts to meet the challenges of the next century.

Maximizing the Nation's Investment: Essential Research-Policy Linkages

Those who shape our Nation's policies and programs related to children, youth, and families are searching to find ways by which all of America's children can achieve their full promise. Then the information gained through research efforts must be integrated into policy development to enable our society to address its difficult challenges.

To achieve meaningful progress, research on children and adolescents must be used more effectively to inform our Nation's domestic policymakers. The scientific community must better communicate and disseminate significant research findings to policymakers. Policymakers, too, must work with researchers to help identify key questions concerning children, youth, and families that need to be addressed through research.

Understanding the forces that shape young people's development and using that knowledge to influence public policy and service delivery should be a cornerstone of the Federal Government's research enterprise. An example of the successful potential of this process is described in the box in this section. To neglect this fundamental building block risks compromising national goals of security, economic prosperity, and high quality of life for all.

The United States Experiences Dramatic Declines in Childhood Iron Deficiency Anemia[1]

Iron deficiency, a widely prevalent condition in America that causes anemia, has serious effects on the health and development of infants and children. Infants with iron deficiency anemia have been shown to score lower on tests of mental and motor development than their healthy counterparts. Evidence also points to long-term effects of iron deficiency at young ages including impairment in general intelligence, language capability, fine and gross motor skills, and visual integration.

Public policy efforts to reduce iron deficiency date back to the 1940s, when the NAS endorsed the addition of iron to white flour and the Food and Drug Administration (FDA) established Standards of Identity for enriched flour. By 1990, 95 percent of grain products in the food supply were enriched, contributing to a 50 percent increase in per capita consumption of iron.

Food assistance programs directed toward specific populations have also succeeded in improving the iron status of these groups. The USDA's WIC program, established in the early 1970s, is especially noteworthy. WIC provides highly nutritious, iron-fortified food to low-income women who are pregnant or breast-feeding and to their children up to the age of five. The program also provides nutrition education and increased access to other health care and social services, including prenatal care. One of the goals of the WIC program is to reduce the incidence of iron deficiency among this high-risk population.

Research shows that the overall prevalence of anemia in children from low-income families who participated in WIC declined from 8 percent in 1975 to about 3 percent in 1985. Among inner-city infants who were given an iron-fortified formula during the first year of life, only 1 percent suffered from iron deficiency anemia as compared to about 9 percent of infants who did not receive an iron-fortified formula.

Despite these improvements, iron deficiency anemia in infants and children remains a public health concern. To assure the health and well-being of America's children and infants, continued monitoring of iron levels as well as dietary interventions are needed.

About This Report

This report, coordinated by the NSTC (see "About the Children's Initiative" box), provides starting points for the Federal Government over the next few years as it evaluates the research investments to be made on key issues affecting the health, education, and well-being of children and youth. This report urges strengthening the use of research findings to inform policy and program development and for establishing productive partnerships among public and private sectors. Taken together, the steps recommended in this report should leverage the Federal investment in scientific research on children and youth, and the enhanced effectiveness of the policy development process.

This report provides several examples of important research issues concerning children and adolescents. A dynamic research framework and agenda is needed that would involve partnerships among research and policy groups in the Federal Government, in collaboration with non-governmental researchers and practitioners. This report should be considered the first phase of a sustained effort directed towards that end.

Organization of Report

This report is organized into four sections. Section I, a Snapshot of the Federal Research Portfolio, briefly describes the current Federal investment in research on children and adolescents. The purpose of this assessment of activities is to provide the basis for identifying gaps (Section II) in knowledge and Federal research investment.

Section II, Gaps in the Knowledge Base: Examples of Research Opportunities, provides examples of research needs in understanding children's biological, cognitive, and social development, and a basis for establishing research priorities.

Next, Section III, A Key Element of the Research Enterprise: Links to Policymakers and Service Providers, discusses the need for establishing stronger links among researchers, policymakers, and service providers to develop policies and programs that meet the needs of children and adolescents.

The report concludes with Section IV, Next Steps: Options for Phase Two of the Children's Initiative, which provides recommendations for building on the work of this first phase.

About the Children's Initiative Subcommittee

In May 1996, the NSTC's Committee on Fundamental Science and Committee on Health, Safety, and Food formed the Children's Initiative Subcommittee to explore the Federal investment in research focused on the biological, cognitive, and social development of America's children. Representatives from 23 Federal agencies involved in child and adolescent research programs came together to examine the Federal investment in this area and to foster coordinated efforts. The major goals of the Subcommittee were to:

- Assess the size and scope of the Federal research portfolio on children and adolescents, and identify gaps in the current knowledge base and in the research funding.
- Identify key research issues in children's biological, cognitive, and social development.
- Strengthen research-policy linkages and develop a sustainable process for collaboration and communication of scientific knowledge about childhood and adolescence within the Federal Government.

(A list of representatives is included in Appendix A.)

I. Snapshot of the Federal Research Portfolio

The Current Federal Investment

One question the Children's Initiative sought to answer was "How much does the Federal Government spend on research and development related to children and adolescents?" To identify this Federal research and development portfolio (R&D), RAND's Critical Technologies Institute (CTI) conducted an analysis using a newly developed database (RaDiUS) of research and development activities across the Federal Government (see "About the Data Analysis" box). This analysis was refined by additional input from Federal agencies. These R&D efforts address a broad range of issues affecting children's biological, cognitive, emotional, and social development, as well as the factors shaping their behavior from the prenatal period until their entry into the labor force.

About the Data Analysis

RAND's Critical Technologies Institute (CTI) conducted its analysis using the RaDiUS database that contains information submitted annually to OMB by all Federal agencies about their R&D projects. The database currently contains approximately 80 percent of all Federal domestic R&D projects related to children and adolescents. The remaining 20 percent was determined by the assumption that the proportion of each agency's R&D remained the same as represented in the 80 percent. A number of agencies also provided information directly to CTI to supplement the RaDiUS data. "Children's research" encompasses the life cycle period from prenatal to entry into the labor force and includes research directly related to the physical, cognitive, psychological, and social development of children and youth.

Care must be taken, however, in the interpretation of the data. Some agencies may report program evaluation studies to OMB as part of their R&D, while others may not. For this reason, the agency-specific CTI figures cited in this report must be interpreted with caution.

CTI identified R&D projects for children and adolescents by reading agency project abstracts. For each project identified as focusing on children and adolescents, CTI characterized the research.

Appendix B contains a more detailed description of CTI's methodology and a list of the Federal departments and agencies included in the analysis.

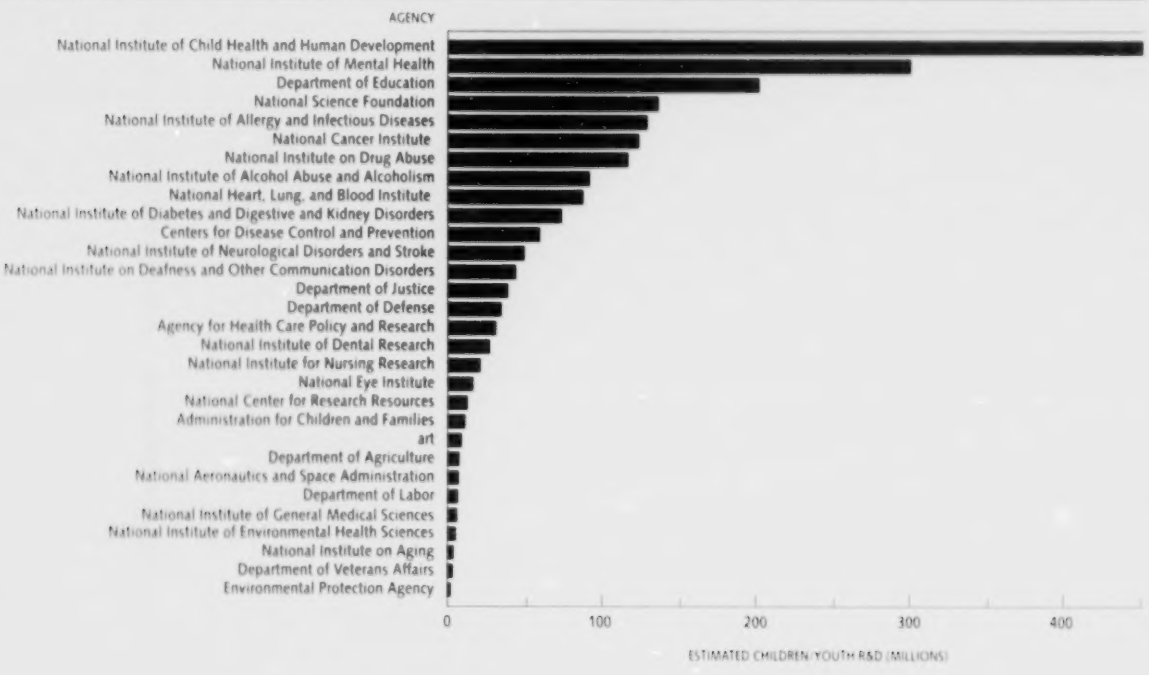
BEST COPY AVAILABLE

The CTI analysis aimed to estimate the Federal portfolio; it is not a comprehensive, in-depth examination of each Federal R&D project related to child and adolescent development.

CTI found that, in fiscal year (FY) 1995, the Federal Government spent an estimated $2 billion on R&D directly related to children and youth. These funds were distributed among 12 Federal departments including eight agencies within the U.S. Department of Health and Human Services (HHS) and 21 funding components within the National Institutes of Health (NIH) and three independent Federal agencies (figure 1). The National Institute of Child Health and Human Development (NICHD), the National Institute of Mental Health (NIMH), and the Department of Education (ED) account for about half of the research. However, each of the 15 Federal departments and independent agencies has a specific mission for its R&D efforts, which is often linked closely to its service programs, and provides valuable findings to enhance the knowledge base about children and adolescents. A key challenge lies in collecting, analyzing, and synthesizing what this knowledge base tells us about what the Nation can do to ensure the healthy development of all American youth.

There are several ways to put in perspective the estimated $2 billion Federal R&D investment in children and youth. One way is to compare this investment to the total Federal R&D budget, which includes research on defense, energy, health and other topics. Such a comparison shows that Federal R&D on children represents less than 3 percent of the total Federal research investment of $70 billion, and about 6 percent of the $31 billion non-defense R&D budget (figure 2).

Figure 1. Many Federal Agencies Have Research on Children/Youth Reflecting the Diversity of the Problems and Research Agenda

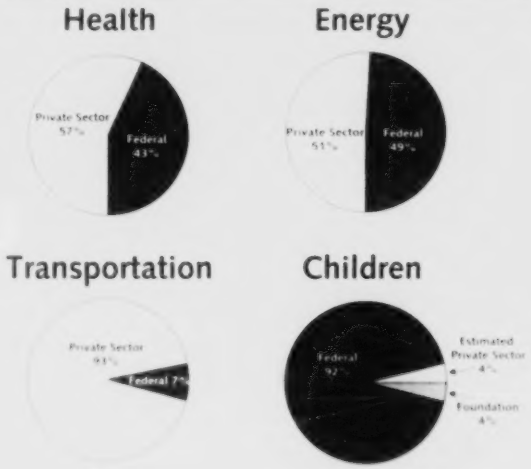

AGENCY
National Institute of Child Health and Human Development
National Institute of Mental Health
Department of Education
National Science Foundation
National Institute of Allergy and Infectious Diseases
National Cancer Institute
National Institute on Drug Abuse
National Institute of Alcohol Abuse and Alcoholism
National Heart, Lung, and Blood Institute
National Institute of Diabetes and Digestive and Kidney Disorders
Centers for Disease Control and Prevention
National Institute of Neurological Disorders and Stroke
National Institute on Deafness and Other Communication Disorders
Department of Justice
Department of Defense
Agency for Health Care Policy and Research
National Institute of Dental Research
National Institute for Nursing Research
National Eye Institute
National Center for Research Resources
Administration for Children and Families
art
Department of Agriculture
National Aeronautics and Space Administration
Department of Labor
National Institute of General Medical Sciences
National Institute of Environmental Health Sciences
National Institute on Aging
Department of Veterans Affairs
Environmental Protection Agency
0
100
200
300
400
ESTIMATED CHILDREN/YOUTH R&D (MILLIONS)

It is equally important to place children's R&D in the context of the Nation's total R&D expenditure — including all levels of government and the private and nonprofit sector. The private and nonprofit sectors provide more total R&D funding than the Federal Government — an estimated $100 billion in FY95. However, little of this private and nonprofit research is directed toward research on children (excluding product-oriented marketing research). Foundations spent an estimated $75 million on research for children in FY95, and the remaining nonprofit sector and State and local governments contributed less than $300 million. Thus, the share of total national R&D directed toward children is less than 1.2 percent.

Figure 2. Research on Children/Youth is Estimated at 3 Percent of Federal Research and Development Spending in FY95[12]

Unlike other areas of research, the Federal Government bears almost total responsibility for R&D on children. For instance, the private sector provides over 50 percent of health and energy R&D funding and over 90 percent of transportation R&D (figure 3).

Figure 3. Unlike Other Research Areas, the Federal Government is Almost the Sole Funder of Research on Children/Youth[13]

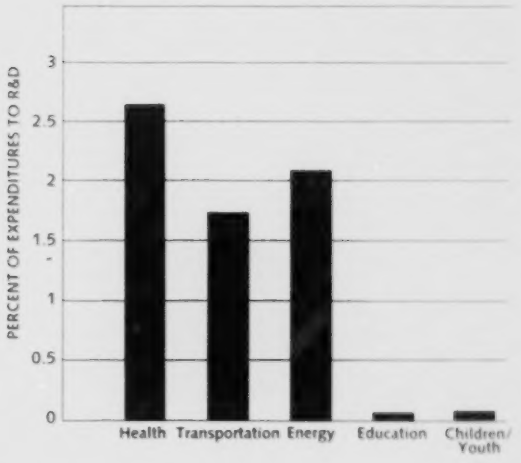


In contrast, the Federal Government provides approximately 90 percent of children's R&D. Thus, it is even more essential that the Federal research portfolio be well coordinated across agencies and adequate to address the critical social, educational, and health issues facing children.

A second way to consider the investment in R&D for children is as a proportion of total expenditures on children. The U.S. investment in R&D is between 2 and 3 percent of national expenditures (Gross Domestic Product, or GDP). In the areas of health, energy, and transportation, the Nation invests between 2 and 3 percent of expenditures in R&D (figure 4). This R&D

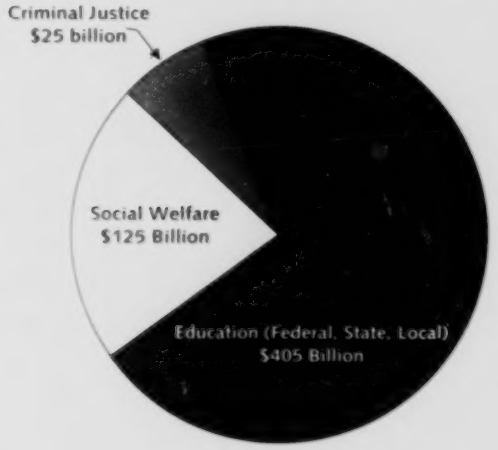
commitment of 2 to 3 percent is directed toward making the expenditures in each area more effective and efficient.

Figure 4. The Share of Expenditures Devoted to Research and Development is Significantly Smaller for Children/Youth Than Other Areas



In contrast to the 2 to 3 percent commitment in other areas, less than three-tenths of a percent of the expenditures on children is spent for R&D on children. Total government expenditures for children and youth in FY95 were an estimated $555 billion, almost two-thirds of which was devoted to K-16 education. Most of the remaining funds were allocated for social welfare (including AFDC, Medicaid, Head Start, WIC, and Food Stamps), criminal justice (including police, courts, and prison expenditures), health care, and other programmatic expenses (figure 5). Private sector expenditures for children are far larger than public sector expenditures, so our total R&D

Figure 5. Research Could Reduce or Make More Effective the Extensive Government Services on Behalf of Children/Youth



commitment to children of $2 billion to $2.4 billion is certainly less than three-tenths of a percent of public and private expenditures for children.

Given these comparisons, an obvious question is whether the Nation's investment related to child and adolescent R&D is consistent with our research investments to solve other social, economic, energy, transportation, and health problems. Put another way, the estimated $2 billion investment is aimed at understanding the growth and development of 30 percent of the Nation's population — over 80 million children and adolescents under age 21. The lack of dramatic progress on some youth-related problems may stem from having limited R&D funding that must be spread across the spectrum of developmental problems arising during the first 20 years of life.

This research investment in children must address not only all developmental issues (social, emotional, cognitive, and health) from before birth to age 21, but also a wide range of social issues (such as education, social services, and delinquency). In addition, this research seeks not only to address the developmental issues and problems which arise during childhood, but also to uncover the origins of health conditions that are manifested later in life but have their genesis and best hope for prevention in childhood. The annual health care cost of four such conditions alone (atherosclerosis, osteoporosis, diabetes, and obesity) exceeds $100 billion.

Younger Americans may benefit from programs for which they are not specifically a target group. The funding for these programs, such as those directed toward general health and family research, is not included in the estimate of the amount directed explicitly at child research.

II. Gaps in the Knowledge Base: Examples of Research Opportunities

Although a great deal of knowledge about young people has been gained from past research in the social, behavioral, and life sciences, a clear need exists to further advance our understanding of what enables all children to grow up to be healthy and active members of society. To develop effective policies and programs regarding children, adolescents, and families, an integrated, multidisciplinary approach is essential. The Children's Initiative Subcommittee identified the following cross-cutting, interrelated themes as among those that should characterize such an approach.

- *Recognize the importance of basic, theory-informed, hypothesis-driven research on developmental processes.* Fundamental research on developmental processes during the prenatal period, infancy, childhood, adolescence, and young adulthood should be a cornerstone of the child and adolescent research enterprise. Such knowledge provides an essential foundation from which to design programs, inform public policy, and conduct research on efforts to promote child and adolescent health. This research yields information that can help address not only problems that occur in childhood, but also those that do not appear until later in life but have their antecedents in childhood. Such health conditions include atherosclerosis, diabetes, osteoporosis, obesity, and some cancers.

- *Understand a child's overall development over the long term.* Research should address the relationships among biological, cognitive, social, and emotional aspects of human development over the life course. Though research is making strides in this regard (for instance, there are links between social and cognitive development research), insufficient efforts have been made to link cognitive, social, and emotional domains to biological factors. The multiplicative effects of risk factors are rarely considered. Our understanding of how the whole child develops during the first 2 decades of life, therefore, remains limited.

- *Examine child and adolescent development in the context of their families and communities.* A multidisciplinary research approach should create, improve, and sustain longitudinal studies of representative samples of all children over at least the first 2 decades of life and preferably into adulthood. (Minority and poor children have been the primary focus of problem-oriented research. They are too often neglected in normative developmental research, which typically focuses on children from white, middle-class families.) Such a long-term strategy will help to increase our understanding of how families, peers, schools, community organizations, media, and social institutions together influence the totality of child

and adolescent development. Recognition of multiple influences is critical to the design of programs and formation of public policy.

- *Attend to "positive" outcomes for children and adolescents.* Mission-oriented research, by definition, focuses on problems and deficits. For example, research efforts — as well as policies and programs — are often centered on health-threatening or compromising behaviors; comparatively few efforts examine health-enhancing behaviors. However, many children and adolescents do adopt positive behaviors and more attention is needed to find ways to help teens, families, schools, communities, and the media encourage such behaviors. Health promotion approaches are inextricably linked to knowledge about how key environmental and situational influences facilitate or hinder young people's efforts to ensure their health and well-being. Policies oriented toward helping more young people succeed will require knowledge about how health-enhancing behaviors can be achieved in diverse populations.

Illustrative Research Issues

This section of the report provides starting points for how the Federal Government can focus its research efforts to address high-priority issues affecting the health, safety, education, and development of all American children and youth. As a first step in identifying research opportunities, a selected literature review was conducted of reports that summarized relevant research and recommended areas for future study (see Appendix C for selected bibliography). To broaden the perspective, each Federal agency represented on the Children's Initiative Subcommittee was asked to submit its top research priorities for the coming years.

During discussions to identify illustrative research issues, the Children's Initiative Subcommittee considered the following criteria: the nature and importance of an issue's impact on children, youth, families, and larger society; the degree of public concern about the issue; the extent to which the scientific community is prepared to advance knowledge of this issue; and the potential for improved research understandings to effectively inform policy (e.g., does a "policy window" of opportunity exist?)

Working from the above cross-cutting themes and principles, the Children's Initiative Subcommittee identified six research opportunity areas concerning the development of children and adolescents that merit further exploration in the next phase. These six areas are: (1) influence of families and communities on child and adolescent development; (2) health and behavior; (3) children and environmental hazards; (4) understanding learning; (5) policy research; and (6) longitudinal studies. An overview of each area follows, outlining current knowledge in this area, topics that need to be explored further, anticipated benefits of advancing the knowledge base, and suggestions for which Federal agencies could work together to act on these research opportunities. Taken together, the six research areas create a functional path that enables us to look at all facets — biological, cognitive, social, and emotional — of children's development.

These six research opportunity areas should be considered illustrative starting points for thinking about the Federal research investment strategy. They are not meant to be the final word on the Federal research agenda, nor do they represent an exhaustive list of

all research questions that will inform policies and programs regarding young people's development. For example, two of the six issue areas — policy research and longitudinal studies — cut across the other four areas.

Research leading to reliable, useful indicators of child and family well-being is a key element of any research enterprise; however, this initiative did not address this element because it concluded that there was sufficient current activity in this area by the Federal Interagency Forum on Child and Family Statistics, Partnerships for Stronger Families, and the NICHD Child and Family Well-Being Research Network. Improved communication among these and other related public- and private-sector research efforts should be established to further enhance the knowledge base about children and adolescents.

Health and Behavior

What We Know

The coming century will witness the expansion of research in behavioral medicine. Children and adolescents will be a special focus of biobehavioral research and of initiatives based on such research that informs efforts to promote health and safety and prevent injury and disease. This focus on young people is imperative because disabilities and chronic diseases resulting in adult morbidity and mortality can be traced directly to behavioral patterns that are often established during childhood and adolescence.

Research has established that a number of personal behaviors are major determinants of long- and short-term health outcomes in children and youth. For instance, the initiation of unhealthy or risky behavior such as substance abuse (including tobacco use), drinking and driving, early or unprotected

Raising the Age for Drinking

Motor vehicle crashes are the leading cause of death for those ages 5 to 24. Research conducted under the auspices of the NHTSA has influenced policy decisions regarding drinking and driving.

In the early 1980s, legal drinking ages for adolescents varied (from 18 years to 21 years) among the States. Research showed that raising the legal drinking age to 21 had a direct effect on reducing alcohol-related traffic crashes among 18- to 20-year old drivers. As a result of these findings, and in response to growing concern over the disproportionate involvement of young drivers in alcohol-related traffic crashes, Congress enacted the National Minimum Drinking Age Act in 1984, requiring all States to raise the minimum age of purchase and public possession of alcohol to age 21, or face loss of highway construction funds. By 1988, all 50 States and the District of Columbia had enacted laws making it illegal for anyone under the age of 21 to purchase or possess alcoholic beverages. Subsequent research documented that State laws setting the legal drinking age at 21 have reduced traffic fatalities involving drivers 18 to 20 years old by 13 percent and have saved over 15,600 lives since 1985.

sexual intercourse, poor nutritional choices, lack of exercise, violence, not wearing safety belts, and not using bicycle and motorcycle helmets is related to poor outcomes during early adolescence and beyond. Given this knowledge, the Federal Government collects information to indicate the general health and well-being of children and youth. The Youth Risk Behavior Survey, for example, monitors serious health-risk behaviors (e.g., unintentional and intentional injury, tobacco, alcohol and other drug use, sexual behaviors, dietary behaviors, physical activity) that contribute to the leading causes of mortality, morbidity, and social problems among young people.

Research also has provided evidence on the effectiveness of particular prevention strategies designed to modify or prevent certain health-risk behaviors. Environmental interventions such as child safety seats, seat belt and motorcycle helmet laws, requirements for child-resistant packaging for certain chemicals and pharmaceuticals, and restrictions on the availability of harmful substances to minors have proven successful in reducing risk. Education interventions, particularly those that involve life skills training, can also lead to reduced risk; for example, studies have shown an association between school-based health education and the reduction of tobacco use in children. While information-based interventions are important, they are insufficient to sustain changes in behavior. Interventions that involve multiple sources of influence within a child's physical, social, and psychological environment (via family, school, church, peers, and other social institutions) are more likely to be effective than approaches that stem from a single institution. Furthermore, cultural and gender factors may influence the effectiveness of particular prevention strategies.

What We Need to Know

Major strides have been made during the past few decades in understanding how health problems of children and youth develop, but the following gaps in our knowledge, while not an exhaustive list, remain:

- *What influences children and adolescents to avoid or engage in risky and adverse behaviors?* To increase the likelihood of healthy youth and adult development we must better understand what prevents young adolescents from engaging in adverse behaviors in the first place. If they do adopt risk-taking behaviors, what influences them to do so and how can such actions be effectively modified? This requires a more advanced understanding of (1) the factors that influence negative risk behaviors — for example, the incentives within a child's or adolescent's environment that serve to sustain these behaviors; and (2) the factors that influence positive, healthy behaviors and the conditions in which such factors thrive. Knowledge about how to strengthen and maintain the impact of positive forces in young people's lives is essential to development of policies and programs that facilitate health-enhancing behaviors.

- *What is the nature of the health behavioral change process for children and youth?* Research is needed not only to capture what contributes to health-compromising and health-promoting behaviors, but also to understand the process of behavioral change in children and adolescents. Existing models of health that are related to behavioral change have focused mainly on adults. Very little is known about behavioral change for young people, for whom the process may be even more complex given the wide variation in child and adolescent developmental levels.

- *To what extent does maternal nutrition influence whether a child will develop chronic diseases later in life?* The influence of maternal nutrition on fetal brain development, hormones, and blood supply has enormous public health implications. However, little is known about the effects of a specific micronutrient deficiency-macronutrient imbalance or over consumption of calories during pregnancy on the development of chronic diseases in later life.

- *What are the cumulative effects of adverse and risky behaviors on child and adolescent development?* Research is needed that looks beyond specific problems of injury, violence, delinquency, teen pregnancy, substance abuse, and other risky behaviors to consider how these problems intersect and connect. For instance, knowing whether common behavioral mechanisms are contributing causes of multiple health risks would provide the basis for developing more effective intervention strategies. There is a need for research on the social, cultural, and behavioral factors influencing "risky behaviors" which result in trauma injuries to children and youth. Transportation-related examples include (1) drinking and driving; (2) failure to wear bicycle or motorcycle helmets; and (3) improper use of, or failure to use, child restraint systems or seat belts.

- *How do health risk behaviors compare among different age groups?* The majority of research conducted and data collected on youth and health-risk behaviors focuses on older adolescents. Our capacity to monitor younger children's health and well-being is currently limited — especially in the areas of social and behavioral development. Information is very much needed on such development for different age groups, especially middle childhood. Such research will help to inform the timing of intervention strategies. Although it may be more difficult, the optimal time to study children in relation to health-risk behavior is during the transition from middle childhood to the teen years. To teach children about the potential effects of current behavior and help them develop the necessary skills to avoid engaging in risky behavior requires more extensive knowledge about social relationships that children form during middle childhood and the influence that peers and the media can have on experimentation and acquisition of adverse or positive health behaviors. The contribution of gender, ethnicity, and socioeconomic status to understanding age-related development should also be considered.

- *How do environmental, family, and situational influences affect child and adolescent health-risk behaviors?* Research shows that how parents interact with their children can affect the extent to which young people are initiated into risky behaviors. Research is needed to identify the most effective strategies families can use to support their children's healthy development. This is particularly true during middle childhood, when parents can play a critical protective role in guiding children's acquisition of healthy behaviors. Research is also needed on the effects of other environmental and situational influences — such as the media and popular culture, peer groups, schools, and community organizations — on the health-risk perceptions and behaviors of children and adolescents. All of these influences are potential tools in designing effective health promotion approaches.

- *How do children and adolescents perceive the risks of engaging in health-compromising behavior and what approaches would help them to adopt more health-enhancing behavior?* Though most youth who engage in health-compromising behavior understand the long-term consequences of their actions, they may not consider such repercussions relevant and, therefore, are unlikely to change their behavior. Research which takes into account different socioeconomic backgrounds and different ethnic or racial groups should address questions related to children's understanding of potential risks and outcomes. Such research should also explore their developmental capacities to perceive relationships between their actions and the short- and long-term consequences. For example, children who smoke do not consider the long-term consequence of cancer to be as relevant as the short-term consequences of peer acceptance, and the effect of smoking on breath and teeth. For some, immediate social acceptance may be a more powerful influence than poor health, especially if it occurs during their adult years.

How Federal Agencies Conducting Research Could Work Together in this Area

The NIH Office of Behavioral and Social Sciences Research is playing a major coordinating role across the NIH to assure that the behavioral aspects of health are well integrated into the Nation's health research enterprise. The National Science Foundation (NSF) supports research on the cognitive and decision-making underpinnings of risk perception and behavior. At the same time, other agencies of the Federal Government such as the CDC, ED, USDA and the U.S. Department of Transportation (DoT) are engaged in efforts to promote health and prevent disease and injury. The U.S. Department of Justice (DoJ) supports programs and approaches to prevent and treat violence, now considered a major threat to public health.

Research findings have now established that problematic outcomes in child and adolescent health do not occur in isolation from one another. Health-compromising behaviors, such as poor diet, smoking, and inadequate exercise and fitness, tend to cluster in the same individual. Likewise, health-enhancing behaviors, such as regular use of seat belts, and avoidance of harmful substances such as tobacco, also tend to cluster. This line of evidence indicates that child and adolescent health and behavior initiatives in the future must involve agencies, that, heretofore, have focused on specific health outcomes.

Children and Environmental Hazards

What We Know

Children face a wide array of major environmental health threats, including lead poisoning, chemicals and pharmaceuticals, pesticides, air and water pollutants, drinking water contaminants, toxic waste dumps, second-hand tobacco smoke, and polychlorinated biphenyls (PCBs). The effects of these environmental hazards can be debilitating. Children exposed to such threats can experience a host of problems, including asthma, cancer, central nervous system damage, respiratory illnesses, behavioral and learning problems, and delayed development. Asthma deaths are on the rise in children and young people, increasing by 118 percent between 1980 and 1993, and asthma is now the leading cause of children's hospital admissions. Lead poisoning is also a leading environmental health hazard for young children, affecting as many as 900,000 children ages 5 and under, according to the CDC.

Reducing Childhood Lead Poisoning: Signs of Progress[14]

Efforts to understand the extent of lead poisoning in America's children began to flourish in the 1950s, as people became more aware of the harmful effects of lead exposure and its sources. Lead poisoning adversely affects three major organ systems in the human body: the central nervous system (specifically, the brain), the kidneys, and the blood-forming organs. Children can experience lead exposure not only from lead-based house paint, but also from leaded gasoline, drinking water, and household products.

Numerous Federal agencies — the EPA, the NIH, the CDC, ASTDR, HUD, and the CPSC — have cooperated to generate the data needed to understand the consequences of lead exposure to infants and children as well as how to prevent and treat it. One of the greatest steps in protecting children's health occurred 20 years ago, when the EPA phased out lead in gasoline and the CPSC also banned lead in residential paint, coatings, and certain other consumer products.

In the 1980s, studies tracking children from birth showed that levels of lead in children's blood previously thought to be safe were, in fact, associated with serious neurological and behavioral problems such as impaired coordination, increased aggressiveness and hyperactivity, and lower IQ scores. CDC revised their screening guidelines for acceptable blood lead levels in children, from 60 g/dL in the 1960s to 10 g/dL today. In 1991, CDC recommended that virtually all children be screened for lead exposure and poisoning.

CDC, HUD, EPA, and CPSC issued strategies for elimination of lead poisoning. Together, these efforts have led to a 98 percent reduction in lead levels in the air and protected millions of children against serious, permanent learning disabilities. From 1976 to 1993, the percentage of children ages 1 to 5 with blood lead levels higher than acceptable levels decreased from 88 to about 4 percent.

Though lead levels in children have significantly declined, this environmental health hazard currently affects as many as 0.9 million children age 5 and under. The fact remains that lead exposure is an entirely preventable childhood health problem. There is still much to be done to protect children — particularly those living in lower income areas or in older homes threatened by chipping or peeling paint and excessive amounts of lead-contaminated dust. Also, there is a host of other environmental hazards, the effects of which on child and adolescent development are still not fully understood; even less is known about their cumulative effects and the risks they pose to children.

Research shows that children are at special risk, compared to adults, from these and other environmental hazards in three ways. First, because children's bodies and organs are still developing, they are often more susceptible to environmental threats. Children move through several stages of rapid growth and development, from conception and infancy through adolescence, during which they can be particularly sensitive to exposure to environmental toxins. Second, because children eat proportionately more food, drink more fluids, breathe more air, and play outside more than adults, they are exposed to more environmental threats. Children thus may ingest more pollutants per pound of body weight. Finally, because children are least able to protect themselves, their behavior exposes them to additional environmental hazards. Children's natural curiosity and tendency to explore leave them vulnerable to health risks adults can more easily avoid. When young children crawl on the ground or the floor or play outside, they are more exposed to a wide array of potentially hazardous substances.

The Federal Government including: the Environmental Protection Agency (EPA), the National Institute of Environmental Health Sciences (NIEHS), the CDC, the Consumer Product Safety Commission (CPSC), the Agency for Toxic Substances and Disease Registry (ATSDR), and the Department of Housing and Urban Development (HUD) has made important contributions to answering some of the questions concerning the effects of environmental hazards on children. These activities range from basic research to systematic evaluations examining whether environmental protection efforts are adequately safeguarding children's health. The EPA has recently proposed new pesticide and chemical testing guidelines to more completely identify neurological, developmental, and reproductive effects on children.

What We Need to Know

Through research on the risks associated with exposure to environmental hazards, significant gains concerning the health and well-being of children and adolescents have been made. Yet much more can be done to protect children from environmental health hazards. Questions that require further exploration include:

- *How can we improve the identification of and response to environmental threats to children's health?* Although progress has been made toward quantifying the risk environmental hazards pose to children, our ability to identify environmental threats to children's health and then develop effective strategies to address them must improve. While a great deal is known about some hazards, researchers are just beginning to understand others more fully. For example, increasing scientific attention has been focused on the potential effects of synthetic chemicals on the hormone system. These chemicals — known as endocrine disruptors — may pose a major hazard to children. A number of chemicals, including organochloride pesticides such as DDT and chemicals such as PCBs, can cause endocrine disruption in wildlife and laboratory animals. Because very low levels of chemicals that block or mimic reproductive and thyroid hormones can determine the course of prenatal development, there is substantial concern about the potential for birth defects and alterations of normal growth and development in children from suspected endocrine disruptors. The NSTC Committee on Environmental and Natural Resources (CENR) has established a committee to coordinate endocrine disruptor-related research throughout the Federal Government.

- *How can we prevent cumulative exposures to a hazardous substance from multiple sources?* Even if risks from a chemical are known, it is difficult to reduce these risks when the exposures occur from unrelated sources, particularly when the chemical accumulates in the body. The most effective approach is for agencies to address the problem in a coordinated and comprehensive program. As an example, lead from leaded gasoline, paint, industrial processes, soil, food, water, dust, certain consumer products such as miniblinds, and toys are sources of lead exposure to children. Individually, some of these exposures are adverse; others are not. However, since lead and lead damage is cumulative in the body, the sum of exposures adds to the body burden and increases the risk of toxic effects. Agencies took a holistic advisory and regulatory approach to prevent hazardous lead exposures from multiple sources. The Federal Lead Paint Task Force, consisting of some 20 different Federal regulatory and advisory agencies, and public and private groups, informed and organized childhood lead poisoning prevention activities. Partnering of public and private efforts, such as the National Lead Information Center (800-424-LEAD), can bring expertise and resources together to address specific lead exposure concerns from a variety of sources. The total success is reflected in the reduction of the average blood lead level for young children in the United States to 3.6 ug/dl from a late 1970s high of 15.0 ug/dl.

- *What are the cumulative effects of hazardous substances?* Even when there is sound information about specific hazardous substances, very little is known about their cumulative or synergistic effects. Traditionally, most environmental protection regulations examine risks on a chemical-by-chemical basis, although in reality people are exposed to multiple substances at the same time. For example, the National Academy of Sciences (NAS) report, "Pesticides in the Diets of Infants and Children," identified this single-chemical approach to regulation as a major shortcoming in the Federal pesticide and food safety regulatory system, particularly as it relates to children. Responding to concerns expressed in the report, pesticide and food safety laws were recently amended, mandating that EPA assess "aggregate exposure" to pesticide residues, including all sources of exposure to chemicals with a common mechanism of action, when determining safe levels of pesticides on food.

- *What kinds of hazards are those to which children are most sensitive, and why?* While it is clear that children are more vulnerable to environmental hazards in general, more detailed information is needed. For example, while children are often more susceptible to environmental threats because their immune, neurological, and other systems are still developing, it is not known to which hazards children are more sensitive, or why.

  Also, children face physical hazard susceptibility regarding motor vehicle-related injuries because they have smaller bodies, and because adults may direct where they sit and may decide whether safety devices are used. Motor vehicle-related injuries are the major cause of death for those ages 5 to 27.

- *When are children most vulnerable to environmental hazards?* Further research is needed to identify windows of particular vulnerability to environmental hazards. Children move through several stages of rapid growth and development throughout infancy and adolescence, during which

they may be especially sensitive to the effects of exposure to toxic substances. Research is needed to help identify these windows of heightened susceptibility in order to focus environmental protection efforts on the highest risk exposures and on outcomes with the greatest potential effects on normal intellectual and physical development.

How Federal Agencies Could Work Together in this Area

Effective partnerships are required to achieve a healthy environment for children. Federal agencies charged with protecting public health and the environment must work together to achieve desired outcomes for young people. One such collaborative effort might be the development of public health guidelines on environmental issues to improve children's health. The ATSDR provides a written series for this purpose. The EPA develops testing and risk assessment policies for environmental pollutants.

A potential opportunity for collaboration within HHS is a recently established subcommittee on children and environment. The subcommittee, convened by the HHS Environmental Health Policy Committee, is charged with coordinating the activities of relevant HHS agencies conducting work in this area. Other agencies such as EPA, the Department of Energy (DoE), and CPSC have been invited to be liaisons to this activity.

Another potential coordinating point is EPA's Children's Environmental Health Initiative. One EPA proposal is to fund academic institutions to advance the understanding of how children are exposed to environmental hazards and children's susceptibilities and vulnerabilities to environmental hazards. The EPA has committed to establish two national Centers of Excellence on Children and Environmental Health in academic institutions. Such an endeavor could be undertaken as a partnership by several Federal agencies. For example, the USDA provides data to the EPA to help monitor and establish estimates of exposure to pesticide residues in foods. The agencies are currently working together to obtain additional data specific to infants and children.

An existing hub for research coordination is the NSTC CENR. The Subcommittee on Risk Assessment has provided a powerful stimulus to standardizing and coordinating the approaches of all Federal agencies to health and environmental risk assessment, and assessment-related research. The CENR Subcommittee on Toxic Substances coordinates research on these topics.

The ATSDR Child Health Initiative, launched in 1996, has focused the agency's programs and public health actions on reducing the adverse effects of toxic substances on the health of infants, children, and youth. This initiative is intended to (1) place a special emphasis on child health issues; (2) implement new projects that benefit children and their families; and (3) solicit input and disseminate information through other government agencies, professional organizations, and child advocacy groups.

Understanding Learning: Studies on Cognition, Development, and Learning Technologies

What We Know

Understanding learning is one of the great challenges in studying the brain and behavior. Children are capable of learning a remarkable variety of tasks relatively rapidly, and continue learning throughout life. Recently there has been widespread recognition that individuals process information in different ways and have preferential methods of learning: visual or auditory stimulation, hands-on learning, repetition, or other pathways.

Our Nation's investment in education depends upon being able to incorporate an understanding of learning into supporting activities and practices to increase the human capacity to learn. Effective approaches must also include understandings of the requirements of different minority populations, including learning disabled children, and effective techniques based on the interplay among educational, social, and behavioral contexts. Basic research is needed on how children learn, on neurologic pathways and brain adaptability, on environments that stimulate learning and remote memory, and on techniques, including the application of information and communication technologies, that can support and encourage learning at higher levels.

Currently, the NSF, the ED, and the NIH all support research related to cognitive development and learning. Enhanced research investments that build upon the convergence of concepts, models, and technologies used in many related disciplines have the potential to yield significant benefits for learning research. Disciplines that contribute to the study of learning in natural and artificial systems, and to the techniques and methodologies for supporting enhanced learning include the social and behavioral sciences, mathematics and the physical sciences, and education and cognitive sciences. An interagency research focus could build on all of the strengths of different participating agencies, capitalizing on ongoing research efforts, fostering cooperation, and highlighting interdisciplinary approaches that offer the highest potential to serve our Nation's education and human resource needs.

What We Need to Know

Science has already demonstrated that the importance of learning and creativity in the first 2 decades of life cannot be underestimated, yet our knowledge base is limited. Many questions still remain.

The examples cited here are not meant to be exhaustive. They represent research needs that could be more capably addressed through interdisciplinary approaches. The unique contributions and research strengths of each agency are important to address these issues.

- *Studies on learning disability.* The following themes will support ongoing and enhanced research on how to bypass physical or mental impairments which can limit learning.
  - Basic research on brain function, neural networks, and learning models to improve understanding of the causes and implications of certain learning disorders.
  - Basic research on brain adaptability and compensation to overcome dysfunction.
  - Research on technologies that facilitate learning and help children to overcome problems associated with learning impairment.
  - Research on mental or environmental stresses that result in impaired learning capability.
  - Research on basic processes or environments that facilitate and enhance natural learning processes, including the creation of effective learning tools that support and guide individual learning for people of all ages in various settings.
  - Testing and evaluating different learning models and approaches in applied settings.

Gaining Access to Learning Through Technology

For more than 40 years, the Office of Special Education Programs (OSEP) in the ED has supported special education research intended to provide practical answers to questions about how best to educate children with physical, sensory, cognitive, and emotional disabilities.

OSEP supports research that looks at how children can learn using technology. These validated technological tools and practices can help children with disabilities become independent and successful learners in their schools and at home. Previously, many of these children would have been denied access to education and become dependent on their families or the government for their care and support. As a result of this independence, the annual cost savings to the public is over $10 billion.

Today, more than 4 million children with disabilities are attending neighborhood schools with their non-disabled classmates. Research--validated technology can be a powerful factor in helping them develop the knowledge, skills, and self-confidence they need to lead personally fulfilling and successful lives. For example, the Kurzweil machine, which converts written words into Braille and speech, helps more than 175,000 blind persons who are presently enrolled in school or employed in our country's workforce. Moreover, this optical character recognition technology enables personal computers to directly receive, edit, and send facsimile messages. Millions of Americans are using advanced telecommunications technology that was developed in part with OSEP discretionary support.

- *Learning at Higher Levels.* Research approaches have the potential to yield important results with respect to an individual's ability to learn in meaningful ways. Interdisciplinary research to enhance children's ability to think critically, process, and communicate information will depend upon research gains on the following topics.
  - Understanding of selective attention and memory management in learning systems.
  - Development and testing of information management tools based on combined insights from neuroscience and cognitive science with methods employed by mathematical scientists, engineers, biologists, biochemists, and psychologists.
  - Research on basic cognitive development and successful techniques to promote higher learning.
  - Research on mental representations and memories including how they are constructed, selected at a given moment, and accessed to solve novel problems.
  - Development and application of technological tools to enable higher learning and enhanced memory capability.

Many other problems and issues associated with supporting and maximizing learning potential similarly require interdisciplinary approaches and understanding. Research on basic cognition, approaches to learning, and limits and enhancements to learning ability will be generalized to other educational and workplace challenges individuals face into adulthood.

- *What effect do multimedia technologies have on children's development?* Computers and technology are fast becoming a part of everyday life for children and adolescents, both in and out of school. Yet little is known about how powerful, multimedia technologies and the images they produce affect the information processing, knowledge, and decision-making skills of children. Understanding of the effects of the mass media and electronic marketing (e.g., Internet) on health-compromising choices such as inadequate diet and exercise, smoking, alcohol, and drug use remains limited, yet is potentially critical to efforts to improve health practices.

- *What is the role of nutrition in enhancing a child's ability to learn?* Research findings suggest that nutrients play an important role in the brain functioning and cognitive development of children and adults. Additional research is needed to define the role of key nutrients in neurological function to understand how diet affects development during gestation and early developmental stages, and what nutrients are required for optimal cognitive development and peak functioning. Understanding what nutrients result in improved cognitive functioning throughout life would have important bearing on policy development regarding nutritional requirements during early development and beyond.

- *What are the effects of childhood head injury on learning and intelligence?* Head injury is a leading cause of accidental death and disability among children. Studies have shown that children under the age of 14 years are more likely to sustain head injuries than adults, and that children's head injuries are often of increased severity. Despite the high incidence of head injury among children, studies addressing mechanisms of injury, recovery from injury, and impact on learning and intelligence are lacking. Development of head injury models that allow meaningful predictions of severity of head injuries related to a wide variety of sports and recreation-related children's activities is needed. Also, models are needed that can differentiate abuse-related injuries from head injuries due to falls.

How Federal Agencies Could Work Together in this Area

Different agencies of the Children's Initiative have unique capabilities and strengths with respect to research on learning. Working together, the potential for advances in theory and application is heightened. Transferability of data and methods to classrooms and other learning sites will also be improved.

The NSF has unique capabilities with respect to interdisciplinary research in this area since it supports basic research on all of the science and engineering fields involved in the study of learning. In 1996, NSF initiated an activity, Learning and Intelligent Systems (LIS), that will fund high-risk, multidisciplinary basic research and technology development on the learning processes in humans, and in artificial systems. Though LIS does not focus specifically on children, the initiative contributes directly to the understanding of learning and cognitive development generally, including the development of prototype

technologies to support and enhance higher-level learning. The research methods employed will also have broad applicability to other research on children. NSF has focused this activity on integrating technology with research and on exploring unifying concepts in the many disciplines that contribute to the study of learning and intelligent systems. LIS's research focus recognizes that advanced information and communication technologies are radically transforming the way people will live, learn, create, and work in the 21st century, and responds to the need to provide supportive technologies that enhance the human ability to learn and create. In addition to the LIS program, NSF also supports basic research in social and behavioral sciences, biology, and other related fields. Through enhanced support, large-scale testing and implementation projects could be initiated; research initiatives could be accelerated.

The NIH also has unique capabilities for funding and conducting research on all aspects of the health sciences, including neurosciences and environmental health effects. Basic research on brain function, pathways, and brain disorders is ongoing at NIH labs and through research grants. With respect to research on learning disabilities, NICHD-sponsored research on dyslexia has recently resulted in new techniques for diagnosing and treating the disorder. Other interdisciplinary, large-scale, and collaborative research projects would be more feasible with enhanced support and cooperation with other agencies.

The ED funds research targeted specifically at education and learning, including process evaluation and models, methods and technologies for learning. Direct involvement of the ED in basic and applied research on learning promises rapid advances in both theory and application. Working together with other agencies of the Children's Initiative which focus on more basic research understanding, the ED has much to offer and gain from interdisciplinary and collaborative efforts.

The Department of Defense (DoD), with both its research and educational programs, could be an important partner in such an effort, given its work in information technology as well as human capital development. The DoD also is expert in the applicability of advanced simulation and presentation techniques, such as virtual reality, to other instructional settings. This work could be applied in the transportation sector for example, the applicability of simulator technology to driver education.

Influence of Families and Communities on Child and Adolescent Development

What We Know

Families and communities make a difference at every stage in a child's development, beginning even before a child's birth and continuing into adolescence. Research is significantly advancing our understanding of the complex ways in which families and communities provide children with opportunities for healthy development or expose them to risks for serious problems. (The term "community" should be broadly interpreted, encompassing various public and mediating institutions such as schools, community groups, religious institutions, the media, and popular culture.)

Research involving infants, for example, is identifying how their interactions with responsive care givers (parents and other adults) provide the foundations for developing a healthy sense of self, forming trusting relationships, and taking pleasure in learning and exploring the world.

Research also is documenting the importance of children's direct interactions in middle childhood and adolescence with their parents as well as with mentors and peers. Findings are shedding new light on important variations in parents' and other adults' abilities to structure and influence children's access to and use of resources — human and institutional — in their communities. Such adult mediation of the community influences children's involvement in positive experiences or in high-risk behaviors such as substance abuse and violence.

There also is new evidence of the importance of building networks of relationships that provide an expanding circle of support for both child and family. Research results on early intervention strategies to promote responsive caregiving and healthy infant development underscore the importance of focusing on both child and family development (e.g., a two-generational strategy), and attending to the role of community conditions and resources. Studies involving families with similar signs of stress indicate that lower child maltreatment rates are associated with the presence of community supports (e.g., churches, Boys and Girls Clubs, school-based community programs). In addition, findings show that parenting practices known to be effective in communities in which there are many resources and few problems are not as effective in communities in which conditions undermine parents' goals, expectations, and interactions with their children. As demographic changes bring about greater cultural diversity, studies are beginning to map both the similarities and the differences among cultural groups in the ways that family and community influence children's lives.

This growing knowledge base is beginning to stimulate a broad range of policy approaches that emphasize working with families and communities to provide children and adolescents with the social networks and supports they require to make a successful transition into adult life. For instance, research has played a vital role in the design and implementation of the new Early Head Start program. Based on principles drawn from research on service delivery, Early Head Start enables communities to design flexible and responsive programs to provide comprehensive child and family support services to low-income families with children under 3 years of age. Longitudinal research is built into the program to generate knowledge that can be used both to improve services and to assess impacts on children, their families, and their communities.

Further, projects supported by the National Institute on Drug Abuse (NIDA) are applying knowledge about childhood predictors of drug use to the development and refinement of preventive interventions that focus on involving schools, families, and peers. In another example, the CDC is developing Human Immunodeficiency Virus (HIV) interventions involving at-risk adolescents and their parents based on research that shows that strengthening familial communication increases the likelihood that adolescents will adopt HIV risk-reduction behaviors. Also, CDC is documenting the positive role of comprehensive school-based health education in influencing the health-risk behavior of adolescents.

What We Need to Know

Given the challenges facing our families and communities, it is essential to build on our current knowledge base and focus on how changes in families and communities can be harnessed for the benefit of children, taking into account gender and racial/ethnic variations. Here are several pressing questions for which answers are needed:

- *How do families and children (or youth) access community resources?* There is limited knowledge about how community-based support structures are established and how families and children (or youth) access available resources. In addition, scientific information is limited about how contemporary media and popular culture influence children and youth and what that means for how families, community groups, and others should interact with youth to convey important information about their health, education, and well-being. Little is known, for example, about when, where, under what conditions, and at what ages various communication strategies are effective with different child and adolescent groups. Likewise, further information is needed about how the availability of transportation transforms the perception of the resources that are "accessible," and those which are not.

- *How do different components of the community contribute to the development of self-protective safety behaviors in children and adolescents?* Understanding the roles played by parents, care givers, preschool and school teachers, coaches, older siblings, peers, and others in the development of safe behaviors could lead to strategies to foster development of such behaviors early in life. Longitudinal behavioral studies that assess relevant characteristics and influences of these groups of people on the development of safe behaviors in children are essential to the development of sound policies and programs.

- *How can communities facilitate an adolescent's safe passage to adulthood?* This transition cannot be understood without linking adolescence to development that occurs during early and middle childhood. Thus, longitudinal research that captures individual development over time and also assesses the characteristics and influences of families and communities is essential to advance our knowledge and better inform policy and practice.

- *How are families and communities changing and how does such change positively and adversely affect children and adolescents?* The scientific literature strongly suggests that instability in the lives of children and adolescents can adversely affect their development and well-being. Research indicates that frequent changes in residence, child care arrangements, or the adult composition of the household can prevent children and adolescents from establishing stable relationships with adults and peers. Children undergoing such changes may also lack supervision in their homes and communities. Observed results should be explored for their utility in policy interventions. It is also critical that we understand the dynamics of positive changes in communities and neighborhoods.

- *How are children, families, and communities affected by major policy innovations now taking place at national, State, and local levels (e.g., in health care delivery, family income support, and economic self-sufficiency)?* For example, provision of income support by the States (rather than by the Federal Government) may result in powerful policy incentives that induce impoverished families to change their residence and household structure frequently. These changes could occur because of the availability of State funding, time-limited benefit structures, and different programs that might arise out of welfare experimentation at the State and local levels. Such residential mobility will challenge research on welfare reform experiments at the local

level. It will require tracking changes in residence and how those changes affect children. Longitudinal designs that are robust enough to account for these changes over time and a diversity of State and local policies are needed to evaluate adequately the effects of welfare experiments at the State and local levels and to support States in developing welfare policies that enhance child and adolescent development while preventing serious problems.

- *How do policy choices regarding physical infrastructure and urban and rural economic development affect children?* While about 70 percent of this country's poor live in central urban or rural areas (U.S. Bureau of the Census, March Current Population Survey, 1995) most job growth is occurring in the outer suburbs, resulting in a geographic mismatch between jobs and poor people. Research should include efforts to analyze: (1) the importance of transportation and mobility for children's and families' overall well-being, and (2) how lack of access to residential transportation may hinder children's and families' social, educational, and emotional development.

How Federal Agencies Could Work Together in this Area

Researchers and those involved in designing preventive programs share an interest in family and community support for children and adolescents. These support systems are often referred to as "contexts" for development to be understood in their own right and for engaging families and communities in facilitating positive outcomes in young people. Thus, a broad range of Federal research agencies is now supporting projects in this area. The ED for instance, is providing support through (1) its research institutes that aim to connect families and communities in supporting the optimal educational achievement of children, and (2) its reorganized elementary and secondary education programs which confer a greater decision-making role at the school level in exchange for accountability for higher student achievement. Other agencies involved include HHS through its research and prevention programs, including comprehensive community-based health promotion programs in substance abuse, mental health, and cardiovascular health; and the CDC through its efforts to promote health and prevent violence and diseases.

Collaborations among these research agencies, especially those that strongly connect educational and health outcomes in children and adolescents, are needed. Young people who are healthy are more likely to benefit from educational opportunities. Likewise, research shows that children and youth who are doing well in school and have supportive families are more likely to engage in health-enhancing behaviors (and less likely to engage in those risky to their health) than are those who are doing poorly in school.

Longitudinal Studies

What We Know

Longitudinal studies that collect information on the same group of participants over time have proven to be important research tools for understanding how children develop and what factors influence their ability to become healthy and productive adults. The principal advantage of longitudinal designs is that they enable researchers to measure developmental processes and the factors influencing these processes as they occur. Just as the well-known Framingham Longitudinal Study of Adults has taught us much about the roles of health, nutrition, and behavioral factors

in cardiovascular disease, longitudinal studies concerning children have provided much knowledge about such factors as the impact of early experience (including healthy diets and exercise programs) on child development, the benefits of fluoridation of water on dental disease, the neurological effects of low-level lead exposure, and the long-term effects of birth trauma. Current longitudinal studies, such as the National Longitudinal Survey of Youth, the Study of Early Child Care, the National Education Longitudinal Study, the National Longitudinal Study of Adolescent Health, and NSF's longitudinal study, the "Panel Study on Income Dynamics (PSID)," are contributing important information to the knowledge base on children and adolescents. Though these studies are difficult to implement and sustain, they yield valuable information that can be achieved in virtually no other way.

What We Need to Know

Longitudinal studies provide a mechanism for understanding what factors are most important in influencing a child's life course. Such knowledge is essential in ensuring that all children grow up to be healthy and contributing adults, thereby reducing significant medical and social costs associated with adverse outcomes. Longitudinal studies could help us answer questions such as:

- *How does children's development in normal conditions compare to what occurs in adverse conditions?* A major gap exists between our understanding of how children develop in normal conditions and what happens to children who are at risk because of abuse and neglect, homelessness, institutionalization, violence, criminal activity, and other adverse conditions. It is important to conduct studies that bridge this gap to increase our knowledge of why some children manage to overcome these disadvantages and go on to lead productive lives.

- *How can families and social institutions help children acquire the values, motivation, knowledge, and skills to become socially responsible and productive adults?* Recent advances in the biomedical, social, and behavioral sciences now enable the design of longitudinal studies that can inform how to optimize children's potential as they make the transition to adulthood. This requires a better understanding of how children prepare themselves for the working world, manage their activities, perceive and manage risks, and develop time-use skills in ways that facilitate their productive capabilities. A longitudinal study integrating multiple scientific disciplines would allow biological, psychological, social, and anthropological perspectives of child development to be blended with an economic framework of human capital investments in children by families and society. Research has progressed and such studies are feasible. Further, we, as a Nation, have come to realize how much our future depends on developing our children's potential to its fullest.

- *How do various childhood experiences affect later adult behavior?* Great Britain has pioneered a special type of longitudinal approach called a birth cohort study, in which a large, population-based sample of newborn children is identified and followed for several decades into adulthood. This type of study has been very successful in connecting biomedical, behavioral, and social information to develop a comprehensive portrait of how childhood experiences help shape later adult behavior and outcomes. Recent scientific advances also suggest birth cohort studies may be an

effective approach for understanding why children's developmental processes may differ across ethnic and socioeconomic groups — an area in which there are currently few answers. Birth cohort studies also hold promise for assessing the neurocognitive effects of psychotropic agents (e.g., Prozac,® Valium®) on fetal and postnatal brain development and other structures and functions, as well as the impact of nutrition and environmental toxins and exposures, during and after pregnancy. Longitudinal studies may help us to better understand the factors in childhood that contribute to safe or unsafe driving behavior, particularly drinking and driving, and use or failure to use seat belts and child restraint systems. Such studies could also determine impact of childhood injuries (e.g., head injuries) later in life. Many nations around the world have or are planning to launch similar studies. If the United States conducted a comparable study, a cross-national database for understanding child and adolescent development under different and similar social and economic conditions would be possible.

- *What kinds of childhood and adolescent interventions are most effective in preventing adverse health behaviors?* Many diseases or health-threatening conditions affecting adults have their origins during the perinatal period and in childhood. Preventive measures can be most effective if interventions take place during these formative years. Longitudinal studies are needed to study interventions on representative populations over time to test their effectiveness, which may not become apparent until years later. A Children's Health Study could address some of the highly significant, long-term health issues in children that can be resolved only in longitudinal studies. Such a study would be analogous to the Women's Health Initiative, which was initiated because no long-term studies on a representative group of women had been done to assess adequately the effects of hormone replacement therapy on osteoporosis, breast cancer, and heart disease; or the effect of reducing dietary fat on breast and intestinal cancer. The lifetime benefits of knowledge gained from such studies in children would be significant.

  A Children's Health Study involving several different cohorts could explore in greater depth the effectiveness of a number of major preventive intervention issues including: strategies to increase children's calcium intake and prevent osteoporosis, dietary and exercise measures to reduce the risk of adult cardiovascular disease, therapeutic and other interventions to prevent obesity (one of the most prevalent adverse health conditions in children today), effective injury prevention programs (including motor vehicle injuries), individual and community-based interventions to prevent teen smoking, identification and intervention programs for children with mental health disorders, and newly developed education interventions to help children with learning disabilities.

  An emerging area is research on preventive interventions in areas including accidents and injury, substance abuse, adolescent pregnancy, youth violence, and obesity. Studies demonstrate that reducing substance abuse by young people requires more than providing information about the dangers of drugs. Information must be supported by teaching young people skills to resist peer influence and providing timely booster sessions throughout the high school years to sustain those initial sessions. Comprehensive commu-

nity-based health promotion strategies that involve parents, local organizations, and the media indicate that multi-level interventions can be effective in preventing substance abuse, but must be sustained over time.

A Children's Health Study, as an analogue of the current Women's Health Initiative, would be one of the best ways to provide answers in the coming decades to many of the most pressing problems facing children today and in the future. Such a study would serve as a highly visible sign of our Nation's commitment to its children. If the research portfolio on young people does not include longitudinal studies, the timing and content of health promotion and disease prevention efforts will not be as well informed by fundamental research on child and adolescent development as they must be.

How Federal Agencies Could Work Together in this Area

Longitudinal studies would greatly benefit from multiple agency involvement. Studies of vulnerable children are of interest to the Departments of Health and Human Services, Justice, Education, Commerce, the CPSC, and the National Highway Traffic Safety Administration (NHTSA). Knowledge gained from birth cohort studies would be relevant to NIH, FDA, CDC, CPSC, USDA, and other agencies. Studies of learning disabilities could build on current interagency cooperation between NIH and ED, which provides a useful model for these types of studies. The NSF-sponsored Panel Study on Income Dynamics (PSID) contains data on the impact of economic variables and conditions on child development and attainment.

Policy Research

What We Know

Policy research is a less developed field than some other areas of children's research, especially those focusing on the basic science of development. Nevertheless, there have been important accomplishments in this area. One example is the research on the benefits of early education programs. Longitudinal studies over the past 3 decades indicate that high-quality early childhood education programs, coupled with parent education, can have long-term benefits for children such as lower school drop-out rates, and reductions in adolescent pregnancy, involvement in the juvenile justice system, and referrals to special education programs. These studies have contributed to the position that investing in early childhood education is cost-effective in preventing later, more costly treatment and intervention programs. (See box, "Early Childhood Programs: They Can Make a Difference" and "Overcoming Adversity: It Can be Done," in the Overview.)

What We Need to Know

This is a critical time for researchers to assess how children and adolescents are affected by policy and regulatory changes. Major restructuring of longstanding social policies has the potential to affect large numbers of children and their families. Several reports have identified, with the participation of the research and policy communities, critical areas for policy research in income support, health care delivery, food assistance, educational attainment, and the transition from school to work. Here are just a few cross-cutting examples[15] of issues researchers are grappling with that have important policy implications:

- *What are the effects of State-level variations in health care, welfare reform, and other services?* For both health care and welfare reform, there is a need to ensure that State-level variations in implementation and outcomes are closely monitored and measured. In health care, changes in the financing system may affect not only access to health care, but also the nature and kind of care children and adolescents receive. Though welfare reform legislation provides States with greater flexibility to redesign income assistance for families and children, it also establishes time limits and requirements for work participation that aim to change parents' responsibilities for supporting their families.

- *What are the combined effects of policy changes on child well-being and what implications do they have on effective service delivery?* Families will be affected by a combination of policies that respond separately to basic needs for food, health care, housing, safe neighborhoods, quality child care and schools, and a reliable source of income. Policymaking must be influenced by assessments of the combined effects of these changes on child well-being. State governments and other groups are seeking better ways to respond to the needs of children and their families and are trying out a variety of ways to integrate services through comprehensive State and community initiatives, systemic reform efforts, and other broad-based strategies. Because standard experimental methods are not always suited to studying changes of this scope, a broader array of research methods is also needed.

- *How will investments made to meet societal infrastructure and mobility needs affect the development and attitudes of children in areas where these investments are made?* A form of a "child-impact statement" is needed. Large-scale investments in physical or information infrastructure systems create basic, long-term changes in the perceived and actual well-being of the people living in or near the area where they are made. These impacts must be taken into account during the early decision-making process. The following issues are particularly important to study:

  - How Federal investments in transportation systems and other kinds of physical infrastructure can improve children's chances of growing up healthy and productive, particularly in central urban and rural areas with limited access;

  - How national transportation and infrastructure policies can support Federal welfare reform, health care improvement, and other major national quality-of-life goals; and,

  - How Federal policies dealing with economic growth, transportation, and infrastructure investment influence State, local, and private-sector decisions and priorities regarding land use, education and health care, and community development.

- *What prevention and intervention models will best foster the health and well-being of children and adolescents?* Research is needed not only to identify when prevention and intervention approaches to prevent problem outcomes should take place, but also to determine how effective such approaches are in reducing problems. In addition, little scientific knowledge exists on what kinds of prevention and intervention strategies work best and the extent to which approaches must be tailored for different groups of children and youth to be effective. Yet another important area of research that needs to be explored

regarding prevention and intervention is the cost-effectiveness of different strategies.

- *What data sources will enable us to monitor and assess how changes in key areas of health and safety, human services, education, and other sectors affect children and adolescents?* A potential strategy for organizing Federal research in this area would be to focus on identifying and, as needed, creating the data resources to achieve at least the following: (1) establish national and State baselines for child and adolescent well-being on a core set of measures to provide data that enable the tracking of trends in child health and safety, education, and well-being; (2) establish State baselines for service provision by documenting, for example, how services are organized and delivered, and their effects on low-income children; and (3) design and conduct child impact studies that have the methodological rigor to establish cause and effect relationships between policy and program changes and the health, safety, and well-being of children and adolescents.

  One possible starting point would be to enhance the National Health Interview Survey (NHIS) to be fielded by the National Center for Health Statistics (NCHS) of the CDC next year. These surveys yield national estimates of health status derived from both physical examinations and survey questions, medical expenditures and family formation, and they can be extended to some large States. An improved statistical system on children, youth, and families could be formed by building on the NHIS nucleus.

How Federal Agencies Could Work Together in this Area

Because effective approaches involve the delivery of services in many areas and yield multiple benefits for children and their families, Federal agencies and other groups should find it advantageous to partner in conducting new policy research on promising approaches. Although the testing of new strategies requires funds not only to conduct research but to also develop and provide services, partnerships are likely a feasible route for overcoming the limitations of a given agency's area of authority or budgetary resources.

A multi-agency partnership effort could involve the HHS's health, social services and welfare research, the ED's research programs, the National Institute of Justice's juvenile justice research initiatives, HUD's research programs, USDA's research on food assistance programs, and education and training efforts undertaken by the Department of Labor.

III. A Key Element of the Research Enterprise: Links to Policymakers and Service Providers

Those who shape our Nation's policies and programs related to children, youth, and families are searching for answers to questions about how to ensure that all of America's children will grow up to be healthy, productive citizens. Many of these questions seek to address the immediate, highly visible threats facing our children and youth (such as underachievement, disease, substance abuse, and injury). Still others focus on identifying and preventing the long-term consequences that may arise 10, 20, or even 30 years after the onset of certain child and adolescent behaviors. For instance, children who smoke, do not exercise, or fail to eat a nutritionally balanced diet today may not exhibit serious health, developmental, or other problems until later in their adult lives — when it can be extremely costly or even too late to take action.

Basic research is a first step — a fundamental underpinning — in closing gaps in our knowledge about child and adolescent development. Indeed, theory-driven, applied and policy-related research efforts that address and build on the six opportunity areas identified in Section II are prime starting points. Advanced knowledge of family and community influences on children's behavior, for example, would help to determine what role families and communities can best play in shaping healthy lifestyle decisions regarding substance abuse, smoking, violence, nutrition, pregnancy and sexuality, and other risky behaviors. Exploring neurological and cognitive development at different ages with varying degrees and kinds of stimulation would also provide information about what kinds of learning situations facilitate optimal growth and development of the skills young people need to lead productive adult lives.

Again, the research must be completed, the knowledge communicated and the contact with the policymaker established. Likewise, policymakers and service providers, for their part, must not only assist researchers into identifying key research questions concerning children, youth, and families, but also must take responsibility for acting on relevant research findings. When successful, such connections can have powerful and beneficial results on children's well-being (see boxes in this section and additional examples provided in Appendix D).

Research-Policy Linkages: Lessons from Computing and Information Science and Technology

The field of computing and information science and technology must be linked to the research, policy, and service sectors. University researchers interact frequently with industry researchers, both through scientific societies and by actually moving between these sectors. Similarly, policymakers at the Federal and other levels are likely to have worked in one or both areas. The ease of movement of people in this field facilitates knowledge transfer and fosters understanding among the sectors. Industry recognizes its dependence on the research base and frequently funds work in universities and in the private sector. These effective interactions among sectors were described in the 1995 NAS report, "Evolving the High Performance Computing and Communications Initiative to Support the Nation's Infrastructure."

Research-Policy Linkages: The Case of Sudden Infant Death Syndrome

Sudden infant death syndrome (SIDS) is the leading cause of death among infants from 1 month to 1 year of age. Though knowledge of the causes of SIDS remain incomplete, research efforts have uncovered certain brain defects concerned with breathing and enabled the development of public health strategies to combat it.

Research sponsored by the NIH over the last 2 decades has identified risk factors associated with SIDS, the effects of sleep position on infant health, and other related issues. This information led the American Academy of Pediatrics to recommend, in 1992, that babies be placed on their backs or sides to sleep. In addition, research conducted by the CPSC provided the first epidemiologic evidence that infants who sleep on their stomachs on top of soft bedding (e.g., pillows, comforters) are likely to rebreathe carbon dioxide. The research showed that rebreathing carbon dioxide trapped in bedding may have contributed to the deaths of as many as 30 percent of the infants initially diagnosed as experiencing SIDS. CPSC warned the public about the hazards of soft bedding through Safety Alerts, a national press conference, and by joining in the "Back to Sleep" public health campaign. The "Back to Sleep" campaign was launched in 1994 and sponsored by a coalition of Federal agencies, the American Academy of Pediatrics, the SIDS Alliance, and the Association of SIDS Program Professionals.

These events have been credited with lowering the percentage of babies placed on their stomachs to sleep from over 70 percent to less than 30 percent, and helping to reduce the death rate from SIDS by 30 percent in the 2-year-period from October 1993 to October 1995. This is a prime example of how research can be linked to practice and program development to achieve a national objective.

Thinking About Linkages

Given the complex issues affecting child and adolescent development, improved connections between researchers and those who develop policies, programs, and regulations concerning the future of young people must be an essential part of the Federal research strategy. Yet, more extensive communication among these groups is not enough. Too often, research is conducted, then policies and programs are implemented based on the initial findings, and the chain of events stops there — with little or no follow-up on the effects and effectiveness of actions taken.

Rather than viewing research linkages with policies and services as sequential in nature, these connections should be thought of in terms of a continuing feedback system, with multiple entry points for feedback and modification in the decision-making process at the Federal, State, and local levels. Such a strategy would enable researchers not only to inform initial policy and program development, but also to monitor and evaluate the implementation of these policies and programs — and their effects on child, adolescent, and family status — on an ongoing basis. Sustained research could provide knowledge that is essential in further shaping and refining policies and programs so that they more effectively address the problems facing our children and Nation.

In thinking about how to create and sustain this continual feedback system, the broader landscape in which researchers, policymakers and service providers work must be considered. The very nature of this landscape suggests that a set of conditions must be in place if successful linkages are to occur, and entry points and feedback opportunities are to be provided. Here are three examples of such conditions that illustrate the complexity of research-policy linkages; these are by no means exhaustive.

- *Top Leadership.* The commitment of high-level Administration officials is fundamental to any successful linkage among researchers, policymakers, and those in direct contact with children and adolescents. Strong leadership is necessary to the creation of a climate in which scientific knowledge is perceived to be important and actually is used as an important factor in decision-making about policies and programs that affect the future of children, youth, and families. Within the Executive Branch, coordination between the NSTC and the DPC on the scientific basis for policy initiatives concerning children and families must be strengthened through the creation of specific linkage mechanisms.

- *Stronger Linkages with University Researchers and Professional Organizations.* Universities and professional organizations are major sources of relevant research knowledge concerning child and adolescent development. As such, they must actively expand their efforts to build and strengthen links to those who develop policies and programs affecting children, youth, and families. In addition, universities have a special responsibility (and opportunity) to prepare future generations of researchers so they can effectively connect research to policy and program development.

- *Clear Lines of Communication with State and Local Policymakers and Service Providers.* Lack of communication about, and dissemination of, knowledge are not problems limited to Federal agencies, university-based researchers, and professional organizations. It happens among others as well, most notably with those at the State and local levels who find themselves faced with new policy and program responsibilities, and a need for reliable knowledge to

make informed decisions and effectively carry out these responsibilities. Not only are States, communities, non-governmental organizations, and others involved in service delivery important users of information, but they are also becoming important sources of critical data concerning child and family well-being in an era of devolution of human services. Establishing close linkages between universities and their surrounding neighborhoods and cities can be a way in which knowledge creation and utilization can be connected for mutual benefit, and for improving opportunities for children.

Linkages

At the national level — in child and adolescent development and other fields — several approaches have been used to bridge the realms of policymakers and researchers to effect knowledge transfer or utilization. For example, the NAS and its various boards were created to advise the Federal Government in shaping research agendas and identifying policy options regarding a broad range of issues. The White House initiated Partnerships for Stronger Families to make the Federal Government a more responsive and supportive partner in efforts to implement comprehensive community-based initiatives to serve children and families. And, more recently, the NSTC called for the establishment of a multi-agency task force to examine the long-standing university-government partnership aimed at advancing science and technology in the national interest.

In its effort, the Children's Initiative tackled the question of linkages from a specific perspective — how the Federal research investment on child and adolescent development can be more effectively used to shape our Nation's domestic policy. The Children's Initiative thus sought to answer these fundamental questions: How can we create and strengthen the linkage between two key agencies within the Executive Office of the President — the NSTC (which coordinates the diverse parts of the Federal R&D enterprise) and the DPC (which oversees the development and implementation of the President's domestic policy agenda) — in a way that fosters important research and policies? And how can this linkage create effective collaboration among and with other Federal agencies that support research on children and adolescents? Recommendations for how to establish and sustain such strong relationships are addressed in the next section.

Though the Children's Initiative was asked to focus solely on research-policy linkages at the Federal level, the group strongly urges similar linkages at the State and local levels.

A Need for Collaboration

In its discussions about establishing and strengthening research-policy linkages, the Children's Initiative identified an essential steppingstone to success: increased multi-agency collaboration and coordination of research on national priorities related to children's health, education, and well-being. Just as linkages should cut across public and private sectors and span all governmental levels, the Federal Government's collaborative approach should also strive to tap the knowledge and experiences of non-governmental researchers. Strategic partnerships with interested public and private sources will be instrumental to addressing the current and emerging needs for relevant data and knowledge concerning children and adolescents.

Calls for more coordination and collaboration in research have been a consistent theme of public and private sector assessments of the research enterprise regarding children and youth. At this juncture, however, there are two compelling reasons why collaboration is even more critical than in the past.

First, the current fiscal climate requires more strategic use of existing Federal research dollars. As noted in Section I, the Federal Government currently bears primary responsibility for supporting research on children and adolescents. Yet Federal agencies are working in an environment driven by constrained resources and public opinion that the Federal Government must scale back. Collaboration and strategic partnerships with other public and private sources are thus needed to leverage resources and maximize their impact on research portfolios concerning children, youth, and families.

Federal Interagency Forum on Child and Family Statistics

The Forum is a multi-agency effort established in 1995 to improve and coordinate the Federal information base about children and families. It has established committees to coordinate the reporting of Federal statistics on children and families, improve the collection of such data at the Federal level, and coordinate Federal data collection and reporting efforts with State and local government efforts. At regular Forum meetings a wide variety of Government agencies, NGOs, and University researchers participate to discuss these issues.

Important factors in the success of the Forum are that it is a bottoms-up effort driven by senior staff of participating agencies and representatives of NGOs and university scholars, and that it cuts across agencies and disciplines to help develop a complete and comprehensive picture of family life and child well-being. Statistical, research, and policy agencies are involved in discussions and it has established partnerships among Federal agencies and with university-based scholars, charitable foundations, and private nonprofit organizations. It also includes representatives from policymaking entities within the Federal Government, policy-oriented researchers in the university community, and policy-oriented non-profits.

Accomplishments of the Forum include success in gathering of statistics about child and family well-being; compiling Government statistics into a preliminary list of the most critical indicators of child and family well-being; and, in collaboration with Partnerships for Stronger Families, produced a comprehensive list of these indicators. It has also co-sponsored and coordinated a series of conferences to improve the knowledge base on fathers' involvement with their families and children.

Second, research on the separate facets of children's development is moving toward a multidisciplinary approach — an integration of biological, cognitive, social, and emotional development and the role social institutions play in children's overall development. No one agency, on its own, can effectively address the complexity and broad spectrum of issues and fully explain the dynamics of their interaction.

The boxes in this section on Partnerships for Stronger Families, the Federal Interagency Forum on Child and Family Statistics, and Research-Policy Linkages in Computing and Information Science and Technology provide insights and lessons for developing promising models of multi-agency collaboration and research-policy linkages.

Partnerships for Stronger Families

Partnerships for Stronger Families is an interagency effort that seeks to make the Federal Government a more responsive and supportive partner in community initiatives to improve outcomes for children and families. A steering committee, representing the White House offices and six Cabinet-level departments, meets monthly to guide the work of cross-agency action teams. Specific topics are explored and recommendations are developed. The current areas of focus include: Technical Assistance, National Indicators, Financing Flexibility, Information Dissemination, and Promoting Intergovernmental Partnerships.

The keys to success for the Partnerships include: (1) cross-agency control and ownership; (2) high-level convening and support and sustained commitment from the top; (3) shared principles and vision; (4) credible convener(s) who do not push a top-down approach; (5) active private sector involvement, including the Annie E. Casey Foundation, and participation of State and local practitioners, policymakers, and program administrators from various disciplines; and (6) establishment of concrete, short-term, achievable goals.

The Partnership for Stronger Families makes recommendations for short-term change that inform broader policy efforts. These efforts are coordinated by the DPC, National Performance Review, the Community Empowerment Board, and OMB.

A report regarding a system of national indicators of child and family well-being is in draft form. Recommendations for restructuring Federal technical assistance to comprehensive community initiatives are being reviewed.

IV. Next Steps: Options for Phase Two of The Children's Initiative

It is time to embark on a multi-agency research effort to address critical issues concerning America's youth. This section outlines a vision and strategy for how the Federal Government can strengthen its research enterprise on children and adolescents, and connect that enterprise more closely with domestic policymaking. The problems facing today's children, adolescents, and families continue to intensify. The Federal Government remains the primary (and virtually only) source of support for scientific research directed toward securing their health, education, and well-being and, thus, our Nation's future. This long-standing role will continue amidst changed conditions. Further, the reality of constrained budgets necessitates that research must play a more central role in increasing our capacity to have more informed policy and program development than in the past.

One thing is clear: No one Federal agency can foster the scientific advances required to strengthen our Nation's investments in its children and youth. Coordination and strategic partnerships among Federal agencies are needed to leverage resources and maximize their impact on the healthy development of the Nation's youth. The Federal Government alone cannot achieve these results — collaboration with other public and private organizations is essential.

To meet this challenge, the Children's Initiative Subcommittee recommends that an Interagency Working Group (IWG), such as the Task Force established in the Executive Order Protection of Children from Environmental Health Risks and Safety Risks, identify activities within their research portfolios that support, inform, and facilitate the achievement of the Administration's key goals of ensuring the optimal health, education, and well-being of all American children and youth.

The IWG will address priorities for multi-agency research activities concerning children, adolescents, and their families. Among the prime candidates for such activities emerging from the first phase are a children's health initiative to understand how chronic health problems, which emerge in later life, can be better prevented; an effort to develop public health guidelines regarding environmental (including standards and regulations) interventions to reduce risks to safety and health among children; and a learning and technology initiative to understand how children learn in interaction with new, evolving technologies and how such technologies can be better designed to promote learning in schools and other settings.

The IWG's responsibilities should include, but not be limited to, the following:

- *Development and implementation of a long-term strategic planning process* — to advance a multi-agency Federal R&D effort related to the optimal development of children and adolescents. The six research opportunities presented in Section II can be used as starting points for this planning process. This process should include the identification and recommendation of appropriate partnerships among public (e.g., Federal, State, and local) and private sector parties (e.g., industry, private philanthropy) interested in ensuring the healthy and productive development of children and adolescents. The results of the strategic planning process should be presented to the President.

- *Identification of key research investment opportunities regarding children and adolescents* — to achieve the overarching goals outlined in the strategic plan. These investment opportunities should highlight the need for and the benefits of a multi-agency, coordinated approach in scientific research concerning young people. OSTP and OMB would play an integral role in working with the IWG to develop a coordinated strategy, including budgetary issues, in which agencies can collaborate on research problems of national concern. These problems include strengthening the collection of reliable child and adolescent indicators and the research that provides us with the factors that influence these indicators over time. A coordinated research strategy on optimal human development from early childhood into young adulthood, particularly on factors supporting learning and development knowledge, should be a high priority.

- *Identification of mechanisms to strengthen research-policy linkages* — not only among NSTC, DPC, Federal agencies, and State and local government, but also among relevant non-governmental organizations and other public and private sector parties at the national, regional, and community levels. Such extensive linkages are needed to ensure that research knowledge generated by Federal agencies and other researchers is effectively used to inform policy and program development regarding children, youth, and families. The means for strengthening such linkages should occur on a regular, sustained, and timely basis.

- *Consider appropriate means for conducting an outside assessment of the IWG's work* — to ensure that the Federal Government's strategic plan and identification of key research investment opportunities, potential strategic partnerships, and mechanisms for strengthening research-policy linkages regarding children and adolescents are on target. The IWG could, for instance, convene an Advisory Board of public and private sector experts from diverse disciplines or engage a relevant governmental or non-governmental entity to undertake this assessment.

A Final Note

Our Nation has a clear stake in ensuring that all of America's children grow up to be healthy, educated, productive, and contributing adults. Scientific research is and will continue to be a catalyst for achieving that goal; it serves as a fundamental instrument for informing, developing, implementing, and refining policies and programs that address the pressing needs of children and adolescents. As such, research must be at the forefront of the highest level of decision-making. The Federal Government is faced with an opportunity to embark on a path that will lead to creating and sustaining conditions that optimize human development and citizenship. Now is the time to take that first step — to establish a coordinated multiagency research approach that emphasizes partnerships among the public and private sectors and linkages between the research and policymaking communities.

Endnotes

[1] President Clinton's State of the Union Address to Congress, January 23, 1996.

[2] *Sources:* Births and Deaths for 1995, (1996), U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, Washington, D.C.; Monthly Vital Statistics Report (June 24, 1996), U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 44(11), Washington, D.C.; Trends in the Well-Being of America's Children and Youth: 1996 (1996), U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, Washington, D.C.

[3] *Sources:* Reading Literacy in the United States (1996), U.S. Department of Education, Office of Educational Research and Improvement, Washington, D.C.; Third International Mathematics and Science Study (1996), U.S. Department of Education, National Center for Education Statistics, Washington, D.C.; Great Transitions: Preparing Adolescents for a New Century (1995), Carnegie Council on Adolescent Development, Carnegie Corporation of New York, New York, NY.

[4] *Sources:* Births and Deaths for 1995 (1996), U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, Washington, D.C.; Trends in the Well-Being of America's Children and Youth: 1996 (1996), U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, Washington, D.C.; Starting Points: Meeting the Needs of Our Youngest Children (1994), Carnegie Corporation of New York, New York, NY.

[5] *Sources:* "National, State, and Urban Area Vaccination Coverage Levels Among Children Aged 19-35 Months — U.S. June 1994-July 95," Morbidity and Mortality Weekly Report, Centers for Disease Control and Prevention, Washington, D.C.; Overcoming Barriers to Immunization (1994), Institute of Medicine, National Academy Press, Washington, D.C.

[6] *Sources:* Butterfield, F. (1995), All God's Children: The Bosket Family and the American Tradition of Violence, Knopf Publishers; "Prison Spending Hurts Schools and Black Students, Report Says," Los Angeles Times, October 23, 1996.

[7] *Sources:* Baugher, E. and Lamison-White, L. (September 1996), Poverty in the United States: 1995, Current Population Reports, U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, U.S. Government Printing Office, Washington, D.C.; Trends in the Well-Being of America's Children and Youth: 1996 (1996), U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, Washington, D.C.

[8] *Source:* Great Transitions: Preparing Adolescents for A New Century (1995), The Carnegie Council on Adolescent Development, Carnegie Corporation of New York, New York, NY.

[9] *Sources:* Trends in the Well-Being of America's Children and Youth: 1996 (1996), U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, Washington, D.C.; "Projected Smoking-Related Deaths Among Youth — United States," (November 8, 1996), Morbidity and Mortality Weekly Report, 45(44), Centers for Disease Control and Prevention, Washington, D.C.; "Vital Statistics Mortality Data, Multiple Cause of Death Detail, 1993," (1993), National Center for Health Statistics, public-use data tapes available from the National Technical Information Service, Springfield, VA. NTIS Accession No. PB-96-501861.

[10] *Sources:* "Long-Term Outcomes of Early Childhood Programs," (1995) The Future of Children, 5(3); Years of Promise: A Comprehensive Learning Strategy for America's Children, (1996), Carnegie Corporation of New York, New York, NY.

[11] *Sources:* Dallman, P. (1990) in Brown, M. (ed), Present Knowledge of Nutrition (6th edition), International Life Sciences Institute, Washington, D.C.; Gerrior, S. and Zizza, C. (1994), Nutrient Content of the U.S. Food Supply, 1909-1990, Home Economics Research Report on Nutrition and Mentoring, No. 52, U.S. Department of Agriculture, Washington, D.C.; Guthrie, J. and Schwenk, N. (1996), "Current Issues Related to Iron Status: Implications for Nutrition Education and Policy," Family Economics and Nutrition Review; Herbert, V. (1992), "Everyone Should be Tested for Iron Disorders," Journal of the American Dietetic Association, 12; Ludwig, W. (1996), Statement before the Subcommittee on Agriculture, Rural Development and Related Agencies of the Senate Committee on Appropriations, U.S. Senate, Washington, D.C.; Oski, F. (1993), "Iron Deficiency in Infancy and Childhood," New England Journal of Medicine, 329(3); Quick, J. and Murphy, E. (1982), The Fortification of Foods: A Review, Agriculture Handbook No. 598, U.S. Department of Agriculture; Randall, B. and Boast, L. (1992), Study of WIC Participant and Program Characteristics, Prepared by Abt Associates, Inc., Cambridge, MA for the U.S. Department of Agriculture, Food and Nutrition Service; Stuart-Macadam, P. and Kent, S. (eds) (1992), Diet, Demography, and Disease: Changing Perspectives on Anemia, Aldine De Gruyter, Hawthorne, NY; Third Report on Nutrition Monitoring in the United States: Volume I (1995), Federation of American Societies for Experimental Biology, Life Sciences Research Office; Yetley, E. and Ginsman, W. (1983), "Regulatory Issues Regarding Iron Bioavailability," Food Technology; Yip, R. et al. (1987), "Declining Prevalence of Anemia Among Low-Income Children in the United States," Journal of the American Medical Association, 258(12).

[12] President's FY98 Budget Submission to Congress

[13] The Safety Net for Children: The Performance of the Safety Net and Changes in Federal Spending on Child Well Being. Sources: Steve Bantolome: Hill, Allison Logie and Gary Hyzer. U.S. Department of Health and Human Services, Office of Assistant Secretary for Planning and Evaluation (Forth Coming).

[14] *Sources:* Tesman, J. and Hills, A. (1994), "Developmental Effects of Lead Exposure in Children," Social Policy Report, 8(3); Environmental Health Threats to Children (1996), U.S. Environmental Protection Agency, Office of the Administrator, Washington, D.C.; Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations (1993), National Academy Press, Washington, D.C.; U.S. Agency for Toxic Substances and Disease Registry (1996), internal correspondence.

[15] Additional examples of research questions can be found in reports of the National Academy of Sciences/Institute of Medicine, Board on Children and Families.

Appendix A:
The Children's Initiative — Principals

Lynn Goldman (co-chair)
Assistant Administrator
Office of Prevention, Pesticides, and Toxic Substances
Environmental Protection Agency

Duane Alexander
(co-chair, September 1996 to Present)
Director
National Institute of Child Health and Human Development
National Institutes of Health

Anne C. Petersen
(co-chair, May 1996 to September 1996)*
Deputy Director
National Science Foundation

Wendy Baldwin
Deputy Director for Extramural Research
National Institutes of Health

Caroline Becraft
Deputy Assistant Secretary for Defense for Personnel Support, Families and Education
U.S. Department of Defense

Jeremy Ben-Ami
Deputy Assistant to the President for Domestic Policy
White House Domestic Policy Council

Barbara Broman
Director, Children and Youth Policy
Office of Assistant Secretary for Planning and Evaluation
U.S. Department of Health and Human Services

Claire Broome
Deputy Director
Centers for Disease Control and Prevention

Peter Edelman
(May 1996 to September 1996)
Assistant Secretary
Office of Assistant Secretary for Planning and Evaluation
U.S. Department of Health and Human Services

Henry Foster
Senior Advisor to the President on Teen Pregnancy and Youth Issues

Olivia Golden
Commissioner
Administration on Children, Youth, and Families
U.S. Department of Health and Human Services

* *Anne Petersen served as co-chair until her departure as Deputy Director from NSF to become Senior Vice President for Programs at the W.K. Kellogg Foundation. At that time, Duane Alexander, Director of NICHD, assumed the co-chair position for the remainder of the Initiative.*

Ellen Haas
Undersecretary for Food, Nutrition, and Consumer Affairs
U.S. Department of Agriculture

Helen Howerton
Director, Division on Child and Family Development
Office of Planning, Research, and Evaluation
Administration for Children and Families
U.S. Department of Health and Human Services

Carolyn Huntoon
Science Division
White House Office of Science and Technology Policy

Joyce Justus
Assistant Director for Social and Behavioral Sciences (May 1996 to August 1996)
White House Office of Science and Technology Policy

Alan Levitt
Special Assistant
Office of Demand Reduction
Office of National Drug Control Policy

Ricardo Martinez
Administrator
National Highway Traffic Safety Administration

Sheila Newton
Director
Office of Policy, Planning and Evaluation
National Institute of Environmental Health Sciences

Martha Farnsworth Riche
Director
U.S. Bureau of the Census

Marshall Smith
Acting Deputy Secretary
U.S. Department of Education

Michael Stegman
Assistant Secretary for Policy Development and Research
U.S. Department of Housing and Urban Development

Ruby Takanishi
Assistant Director for Social and Behavioral Sciences (August 1996 to November 1996)
White House Office of Science and Technology Policy

Jeremy Travis
Director
National Institute of Justice
U.S. Department of Justice

Michael Trujillo
Director
Indian Health Services

Katherine Wallman
Chief Statistician
U.S. Office of Management and Budget

Luther Williams
*(September 1996)** Assistant Director*
Education and Human Resources
National Science Foundation

Catherine E. Woteki
Under Secretary
Research, Education, and Economics
U.S. Department of Agriculture

***Luther Williams was appointed as NSF representative after departure of Anne Petersen.*

The Children's Initiative — Committee Members

Rajen Anand
Director, Program Development
Center for Nutrition Policy and Promotion
U.S. Department of Agriculture

Bennett Bertenthal
Assistant Director
Social, Behavioral and Economic Sciences
National Science Foundation

Gary Christopherson
Senior Advisor for Health Affairs
U.S. Department of Defense

Joseph Conaty
Director
National Institute on Student Achievement, Curriculum, and Assessment
U.S. Department of Education

Jaleh Daie
Science Liaison to the National Science and Technology Council (NSTC)
Research, Education, and Economics
U.S. Department of Agriculture

Lorna English
Program Analyst
Office of Program Planning and Evaluation
Centers for Disease Control and Prevention

Jeffrey Evans
Health Scientist Administrator
Demographic and Behavioral Sciences Branch
Center for Population Research
National Institute of Child Health and Human Development
National Institutes of Health

Nancy Gordon
Associate Director for Demographic Programs
U.S. Bureau of the Census

Jeanne Jehl
Senior Associate
Institute for Educational Leadership
Policy Exchange

Robert Kominski
Assistant Division Chief, Social and Demographic Statistics
Population Division
U.S. Bureau of the Census

Karen Kovacs
Science Office
White House Office of Science and Technology Policy

Donna Leno
Chief, Health Education Program
Indian Health Service

David Lloyd
Family Advocacy Program Manager
Office of Family Policy
U.S. Department of Defense

James Marks
Director, National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention

Bill Mollerstrom
Director of Research
Quality of Life Office
U.S. Department of Defense

Martha Moorehouse
Senior Research and Policy Analyst
Office of Assistant Secretary for Planning and Evaluation
U.S. Department of Health and Human Services

Scott Nelson
Chief
Mental Health Program Branch
Indian Health Services

Belinda Seto
Senior Advisor to the Deputy Director for Extramural Research
National Institutes of Health

Jeanine Smartt
Policy Analyst
White House Domestic Policy Council

Kenneth Tolo
Senior Advisor to the Secretary
U.S. Department of Education

Maria Vegega
Policy Advisor
Traffic Safety Programs
National Highway Traffic Safety Administration
U.S. Department of Transportation

Christy Visher
Science Advisor to the Director
National Institute of Justice
U.S. Department of Justice

Katherine Wallman
Chief Statistician
U.S. Office of Management and Budget

Staff of the Children's Initiative

Donna I. Coleman
Science Division
White House Office of Science and Technology Policy

Kim Dennis
Report Specialist
National Science Foundation

Michael Fernandez
Special Assistant
Environmental Protection Agency

David Grissmer
Consultant to The Children's Initiative
Senior Management Scientist
RAND, Critical Technologies Institute

Leila Harris
Executive Secretary
National Science Foundation

Victoria Spears
Liaison to the Committee on Fundamental Science
White House Office of Science and Technology Policy

Jon-Andrew Whiteman
Research Intern
National Science Foundation

Appendix B: RAND (Critical Technologies Institute) Methodology

RAND's Critical Technologies Institute (CTI) derived an estimate of the FY95 Federal research and development on children and adolescents primarily from the RaDiUS (Research and Development in the United States) database that it is developing. This database contains information submitted annually to the U.S. Office of Management and Budget (OMB) by all Federal agencies about their research and development (R&D) projects and seeks to place all project data in a common format. It currently contains approximately 80 percent of all Federal domestic R&D projects. Prior to RaDiUS, there was no centralized R&D database across Government agencies. Rather, each agency tracked its own R&D projects with varying degrees of centralization, commonality of data elements, and consistency with OMB definitions. The Children's Initiative was one of the first major efforts to utilize the RaDiUS database to develop Government-wide estimates for an area of research. As such, it revealed both the strengths and limitations of the current database, identified areas for improvement, and, in many cases, enabled the testing of RaDiUS estimates with agency estimates.

For each R&D project in the database, RaDiUS collects information on overall budget levels, fiscal year budget level, length of contract, project title and abstract, and responsible contracting institution. The database contains approximately 200,000 projects across Federal cabinet departments and independent research agencies (e.g., the National Science Foundation).

Estimating the amount of R&D on children and adolescents would have been fairly straightforward if four conditions were met:

(1) RaDiUS contained all Government R&D projects with complete data on each project.

(2) All Government agencies used exactly the same criteria and accurately judged which projects met the OMB guidelines for R&D.

(3) Each R&D project could be classified unambiguously by a team of evaluators as being directed toward children and adolescents from information provided in the project abstract.

(4) Time and resources were available to read all R&D abstracts for classification.

An estimate of Government-wide research on children and adolescents could then be obtained by either reading all abstracts or sampling a sufficient number of abstracts and classifying them as either directed or not directed toward children and adolescents. The complexity of the methodology used was necessary to account for the four above conditions not being satisfied.

The first condition was not met since RaDiUS currently contains about 80 percent

BEST COPY AVAILABLE

of Government-wide R&D projects. For some projects in RaDiUS, a key data element is missing which is necessary to classify the project or to estimate its FY95 budget.[1] Research and development estimates include the estimated amount of R&D that was missing from RaDiUS or for which data was incomplete. Estimates were based on the assumption that the proportion of an agency R&D budget devoted to children and adolescents was the same for those projects for which we had or did not have complete information. For instance, if there was complete information on projects which represented 80 percent of an agency's R&D budget, and 10 percent of those projects were classified as directed toward children and adolescents, then it was assumed that 10 percent of the missing budget was also directed toward children.

In general, about one-quarter of the total estimate across agencies pertains to missing projects or data. The assumption that missing projects had the same proportion of emphasis on children and adolescents as on complete-information projects introduces more uncertainty into agency estimates than there is in Government-wide estimates. For some agencies, the missing projects were not random, but represented all R&D from a particular subagency. In some cases, the subagency might place either much less or much greater emphasis on children. Better agency estimates could be made through more research to determine the source of missing data and the mission of that particular agency.

[1] *Estimates for the Department of Defense, the Centers for Disease Control and Prevention, the Department of Health and Human Services (Administration for Children and Families, and Assistant Secretary for Program Evaluation), and the Department of Labor were obtained directly from agency abstracts or from agency personnel. These agencies were insufficiently represented in RaDiUS even for sampling. The departments/agencies included in CTI estimates are given at the end of this Appendix B.*

The second condition was not always met because different agencies use different classification for what is included in R&D. Two examples are evaluation projects and "training" projects. Some agencies classify major evaluation projects as R&D and some do not. Similarly, projects involving training are classified differently among agencies. In general, these differences show up between R&D projects submitted to OMB and internal agency estimates of R&D. RaDiUS uses the OMB classification, but in some cases cannot identify which agency projects have been designated as meeting the OMB guidelines. Because training and evaluation projects constitute a small portion of R&D, these differences across agencies probably make only small differences in overall estimates. However, they can introduce larger uncertainty into particular agency estimates.

The third condition was not met because initial sampling of abstracts and classification by several researchers revealed that several issues would arise with regard to what should and should not be included as R&D devoted to children. Examples include research using animals but directed toward children's health problems, research on children outside the United States, and topics indirectly involving or benefiting children such as divorce, teacher quality, community policing, and curriculum development for high schools. In general, each agency presented a unique set of classification issues. Our approach was to classify projects into three categories:

Category 1: Directly related — Includes research involving children and/or adolescents, studies on problems and issues occurring in childhood or adolescence, and animal research directed toward understanding childhood or adolescent health problems.

Category 2: Indirectly related — Includes research involving children and adolescents outside the United States, topics involving both children and adults, and issues indirectly related to children and adolescents (e.g., teacher supply and demand, grants to minority youth and females to improve opportunities in math and science, and summer institutes for high school math and science teachers).

Category 3: Not related.

For each agency, several types of projects included in Category 2 were defined. Thus, estimates can be made which include or exclude types of projects. The base estimate for children and adolescent research which includes only projects classified in Category 1 was $1.8 billion. This includes a major research category of animal research directed toward issues of children and adolescents. The estimate for Category 2 projects was approximately $700 million. The $2 billion estimate given in the body of the report thus would include a portion of projects classified as Category 2.

Finally, condition four was not met since the time and resources for the project were not sufficient to read every abstract in RaDiUS for classification. Thus a sampling strategy was utilized based on two considerations. CTI wanted to focus more effort on reading abstracts of projects with large budgets than on reading abstracts of projects with small budgets. CTI also wanted to focus more effort on reading abstracts of projects more likely to be related to children. Implementing the first consideration meant reading all abstracts for larger budget projects in each agency and reading only samples for smaller budget projects. "Larger budget" projects were defined as projects having a FY95 budget above the average project budget for the agency.

The second consideration was implemented by identifying two groups of projects within each agency — those having a high likelihood of being directed at children and adolescents and those having a small likelihood. High-likelihood projects were identified through key word searches of abstracts for words that would identify most of the projects related to children. CTI read all abstracts for larger budget and high-likelihood projects, but only sampled the remaining smaller budget and low-likelihood projects. The sampling ratios varied by agencies depending on the number of projects in the latter category, but were typically from 1 in 3 to 1 in 8. CTI attached an appropriate weight to each of the sampled projects that was used in estimating the total amount of research related to children and adolescents.

To develop final estimates for research related to children and adolescents, CTI weighted sums of budgets across all projects classified as Category 1 or 2, and then divided by the proportion of total agency R&D budget authority represented in RaDiUS projects with complete information. Estimates were made by each agency also, although more uncertainty was attached to individual agency estimates than to RaDiUS estimates. This uncertainty pertains primarily to some agencies for which representation in RaDiUS was 60 percent or below. For those agencies that had representation of 80 percent or above and for which there were few classification issues, CTI believes the estimates were much better. For some agencies with very little children's research, but with very large research budgets, estimates were quite uncertain since there were few high-likelihood projects and large numbers of low-likelihood projects. For these agencies, large sampling fractions were used because very few projects were likely to be classified as Category 1 or 2. Thus, large uncertainty may be attached

to those agencies with very little research or children relative to that in other agencies.[2] No efforts were made to improve these estimates because such improvements would not have affected the estimates of total research.

Federal Departments and Agencies Included in CTI Analysis

Departments

U.S. Department of Agriculture
U.S. Department of Commerce
U.S. Department of Defense
U.S. Department of Education
U.S. Department of Energy
U.S. Department of Health and Human Services[3]
U.S. Department of Housing and Urban Development
U.S. Department of the Interior
U.S. Department of Justice
U.S. Department of Labor
U.S. Department of Transportation
U.S. Department of Veterans Affairs

Independent Agencies

Environmental Protection Agency
National Aeronautics and Space Administration
National Science Foundation

Agencies Within the U.S. Department of Health and Human Services

Administration on Aging
Administration for Children and Families
Agency for Health Care Policy and Research
Office of the Assistant Secretary for Planning and Evaluation
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
Food and Drug Administration
National Institutes of Health
- Fogarty International Center
- National Cancer Institute
- National Center for Research Resources
- National Eye Institute
- National Heart, Lung, and Blood Institute
- National Institute for Nursing Research
- National Human Genome Research Institute
- National Institute of Arthritis and Musculoskeletal and Skin Diseases
- National Institute of Child Health and Human Development
- National Institute of Dental Research
- National Institute of Diabetes and Digestive and Kidney Diseases
- National Institute on Drug Abuse
- National Institute of Environmental Health Sciences
- National Institute of General Medical Sciences
- National Institute on Aging
- National Institute on Alcohol Abuse and Alcoholism
- National Institute of Allergy and Infectious Diseases
- National Institute on Deafness and Other Communication Disorders
- National Institute of Mental Health
- National Institute of Neurological Disorders and Stroke
- National Library of Medicine
- Warren Grant Magnuson Clinical Center

[2] *Agencies conducting a relatively small amount of research on children compared to other agencies included the Environmental Protection Agency, the Departments of Commerce, Housing and Urban Development, Interior, Labor, and Transportation.*

[3] *See listing of individual agencies within HHS that were part of the analysis, including individual agencies within the National Institutes of Health.*

Appendix C: Selected Bibliography

The Children's Initiative conducted a selected literature review of the following reports, studies, and articles that summarized relevant research on child and adolescent development and recommended areas for future study. The literature review was intended to be comprehensive, not exhaustive.

Early Childhood Development

Child Care for Low-Income Families: Summary of Two Workshops (1995). Commission of Behavioral and Social Science and Education, National Research Council, National Academy Press, Washington, D.C.

"Long-Term Outcomes of Early Childhood Programs" (1995), The Future of Children, Center for the Future of Children, The David and Lucile Packard Foundation, Vol. 5, Los Altos, CA.

"Low Birth Weight" (1995), The Future of Children, Center for the Future of Children, The David and Lucile Packard Foundation, Vol. 5, Los Altos, CA.

Phillips, D. and Cabrera, N. (eds.) (1996). Beyond the Blueprint, Directions for Research on Head Start's Families, National Research Council, National Academy Press, Washington, D.C.

Report on NIH Pediatric Research (April 1996). U.S. Department of Health and Human Services, National Institutes of Health, Bethesda, MD.

Starting Points: Meeting the Needs of Our Youngest Children (1994). Carnegie Corporation. New York, NY.

Tesman, Johanna R. and Hills, Amanda (1994). "Developmental Effects of Lead Exposure in Children," Social Policy Report, Society for Research in Child Development, Vol. 8, pp. 1-16.

Years of Promise: A Comprehensive Learning Strategy for America's Children (1996). Carnegie Corporation. New York, NY.

Adolescence

Adolescent Health-Vol. 1: Summary and Policy Options (April 1991). U.S. Congress, Office of Technology Assessment, OTA-H-468, U.S. Government Printing Office, Washington, D.C.

Great Transitions: Preparing Adolescents for a New Century (1995). The Carnegie Council on Adolescent Development, Carnegie Corporation, New York, NY.

Learning to Work: Making the Transition from School to Work (September 1993). U.S. Congress, Office of Technology Assessment, OTA-HER-637, U.S. Government Printing Office, Washington, D.C.

Millstein, S., Petersen, A., Nightingale, E. (1993). Promoting the Health of Adolescents: New Directions for the 21st Century, Oxford University Press, New York, NY.

Petersen, A., Compas, B., Brooks-Gunn, J., Stemmler, M., Ey, S., and Grant, K. (1993). "Depression in Adolescence," American Psychologist, 48, pp. 155-168.

Takanishi, R. (1993). "Adolescence," American Psychologist, 48(2).

Takanishi, R. (ed.) (1993). Adolescence in the 1990s: Risk and Opportunity, Teachers College Press, Columbia University, New York, NY.

Physical and Mental Health

Basic Behavioral Science Research for Mental Health (1995). The National Advisory Health Council, U.S. Department of Health and Human Services, Washington, D.C.

Benefits and Systems of Care for Maternal and Child Health Under Health Care Reform: Workshop Highlights (1994). Committee on Maternal and Child Health Under Health Care Reform. Institute of Medicine and National Research Council, Washington D.C.

Jensen, P., Koretz, D., Locke, B., Schneider, S., Radke-Yarrow, M., Richters, J., and Rumsey, J. (1993) "Child and Adolescent Psychopathology Research: Problems and Prospects for the 1990s," Journal of Abnormal Child Psychology, 21, pp. 551-580.

National Plan for Research on Child and Adolescent Mental Disorders (1990). The National Advisory Mental Health Council, National Institute of Mental Health, U.S. Government Printing Office, Washington, D.C.

Education

Educational Reforms and Students at Risk: A Review of the Current State of the Art (1994) Office of Research, U.S. Department of Education, U.S. Government Printing Office, Washington, D.C.

Learning to Work: Making the Transition from School to Work (September 1995). U.S. Congress, Office of Technology Assessment, OTA-HER-637, U.S. Government Printing Office, Washington, D.C.

Mapping Out the National Assessment of Title I: The Interim Report (1996). U.S. Department of Education, Planning and Evaluation Service, Washington, D.C.

A Nation at Risk: The Imperative for Educational Reform (1983). The National Commission on Excellence in Education, U.S. Government Printing Office, Washington, D.C.

Reinventing Chapter 1: The Current Chapter 1 Program and New Directions (1993). U.S. Department of Education, Planning and Evaluation Service, Washington, D.C.

Risks to Students in School (September 1995). U.S. Congress, Office of Technology Assessment, OTA-ENV-633, U.S. Government Printing Office, Washington D.C.

Way, W. and Rossman, M. (1994). "The Interrelation of Work and Family: A Missing Piece of the Vocational Education Research Agenda," Journal of Vocational Education, 19(2).

Zimmerman, M. and Arunkmar, R. (1994). "Resiliency Research: Implications for Schools and Policy," Social Policy Report, Society for Research in Child Development, 8(4).

Economics

Huston, A. (1994). "Children in Poverty: Designing Research to Affect Policy," Social Policy Report, Society for Research in Child Development, 8(2).

New Findings on Children, Families, and Economic Self-Sufficiency: Summary of a Research Briefing (1995). National Research Council and Institute of Medicine, National Academy Press, Washington, D.C.

Violence

The Epidemic of Youth Violence: Effective Solutions Require New Perspectives (1996). William T. Grant Foundation, New York, NY.

Understanding Child Abuse and Neglect (1993). National Research Council, National Academy Press, Washington, D.C.

Violence and the American Family: Report of a Workshop (1995). National Research Council and Institute of Medicine, National Academy Press, Washington, D.C.

Violence in Urban America: Mobilizing a Response (1994). Conference Summary, The National Research Council and The John F. Kennedy School of Government, National Academy Press, Washington, D.C.

Alcohol and Drug Use

Assessing Alternative Evaluation Methodologies: Phase III Report (May 1995). Prepared for the Executive Office of the President, Office of National Drug Control Policy by CSR Incorporated, Washington, D.C.

Drug Prevention Programs for High-Risk Youth (November 1995). Prepared for the Executive Office of the President, Office of National Drug Control Policy by CSR Incorporated, Washington, D.C.

Increase in Use of Selected Drugs: Monitoring the Future. A Study of 8th-, 10th-, and 12th-Graders (June 1994). Preliminary Final Report, Prepared for the Executive Office of the President, Office of National Drug Control Policy by Richard Clayton and the Ann Arbor Group.

Nutrition

Kennedy, E. and Goldberg, J. (1995). "What Are American Children Eating? Implications for Public Policy," Nutrition Reviews, 53(5).

WIC Nutrition Risk Criteria: A Scientific Assessment (1996). Committee on Scientific Evaluation of WIC Nutrition Criteria, Food and Nutrition Board, Institute of Medicine, National Academy Press, Washington, D.C.

General

"Human Capital Initiative: Report of the National Behavioral Science Research Agenda Committee" (1992). APS Observer, American Psychological Society, Washington, D.C.

"Immigrant Children and Their Families: Issues for Research and Policy," (1995). The Future of Children, 5(2).

Statistics on Children

Botsko, C. and Brown, B. (1996). Guide to State and Local-Level Indicators of Child Well-Being Available Through the Federal Statistical System. Child Trends, Inc., Washington, D.C.

Integrating Federal Statistics on Children (1995). National Research Council and Institute of Medicine, National Academy Press, Washington, D.C.

Trends in the Well-Being of America's Children and Youth: 1996 (1996). U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, Washington, D.C.

Appendix D: Examples of Successful Research-Policy or Research-Services Linkages Submitted by Agencies

Bureau of the Census/Housing and Household Economic Statistics Division

- *Poverty:* The Urban Institute's analysis of the effect of the welfare reform bill (Personal Responsibility and Work Opportunity Reconciliation Act of 1996) was based on the Census Bureau's March Income Supplement to the Current Population Survey (CPS). The official poverty statistics published annually by the Census Bureau, based on the March CPS, are among the Federal Government's most widely quoted indicators of children's well-being. These data have recently been supplemented with Survey of Income and Program Participation (SIPP) data showing that children make up a large percentage of the long-term poor (those who remain in poverty for every month of a 2-year period).

- *Health Insurance Coverage:* Health insurance coverage of children is a major concern. Recently, researchers at the RAND Corporation used the SIPP data to examine the effect of the Kassenbaum-Kennedy Health Care Reform bill on health insurance premiums, which RAND found to be minor. This research was cited as one of the reasons behind the bill's final passage.

- *Child Support:* Child support data collected in the CPS and SIPP are used by the Office of Child Support Enforcement in HHS to track the effectiveness of child support collection and enforcement efforts and to gauge whether proposed new child support enforcement efforts will be successful. This measure will continue to gain importance with the passage of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, which seeks to improve enforcement of child support from absent parents.

- *Disability:* SIPP is one of few national databases with a comprehensive set of questions on children's disability status. This data is used to examine the economic resources of families with disabled children in order to evaluate SSI.

- *Child Care:* HHS used SIPP data showing costs and distribution of types of child care of working mothers by income, poverty status, and marital status to form their recommendations to the White House of child care costs required by welfare reform.

BEST COPY AVAILABLE

Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry

Research-Policy Linkages

- *Preventing Perinatal HIV Transmission:* Over the past 2 decades, perinatal transmission of human immunodeficiency virus (HIV) has infected over 15,000 children and claimed over 3,000 lives. In February 1994, NIH announced the interim results of AIDS Clinical Trials Group Protocol 076 (ACTG 076) demonstrating that zidovudine (ZDV) administered to a group of HIV-infected women during pregnancy and labor and to their newborns reduced the risk for perinatal HIV transmission by two-thirds.

  As a result of NIH's 1994 findings on ZDV therapy on pregnant women, CDC led a multi-faceted campaign, along with public and private health organizations, community groups and individuals, to translate the ACTG 076 results into effective prevention measures. Although the concept of using a drug to prevent HIV transmission is simple, implementing an effective prevention program based on this intervention requires many steps. First, standard practice guidelines must be developed, institutional procedures must be established, and providers and staff must be trained about HIV counseling and testing and about using ZDV therapy for HIV-infected women and their children. Maximizing the use of this intervention by HIV-infected women requires that all pregnant women have access to prenatal care, and that they be offered HIV counseling and voluntary testing. In addition to ZDV therapy, pregnant women infected with HIV must also be provided access to other important medical, social, and psychological services needed for their own health. Finally, to maximize the benefit of these prevention programs, surveillance and evaluation studies are needed to assess their impact and determine how they can be improved.

  Many organizations have already begun steps toward developing, implementing, and evaluating perinatal HIV prevention programs. A U.S. Public Health Service (USPHS) task force led by NIH and CDC published guidelines for HIV counseling and voluntary testing for pregnant women and for the use of ZDV to prevent perinatal HIV transmission. Several professional medical organizations have adopted policies in support of these guidelines. The U.S. Congress and many State legislatures are considering or have passed laws promoting HIV counseling and testing of pregnant women, including legislation passed in several States requiring that HIV testing be offered to all pregnant women. The Health Care Financing Administration has required State Medicaid programs to cover the cost of ZDV to prevent perinatal transmission and has also encouraged States to cover the costs of HIV counseling, education, and voluntary testing for Medicaid-eligible pregnant women. The Health Resources and Services Administration has disseminated guidance to sites funded by the Ryan White CARE Act regarding implementation of strategies to reduce perinatal transmission. Conferences and other continuing medical education activities are training public and private health-care providers in the skills required to implement perinatal HIV prevention programs. Ongoing educational efforts are under way to encourage pregnant women to seek HIV testing and to provide information for HIV-infected pregnant women to make informed decisions about using ZDV.

Even in the midst of these activities, findings from early evaluations are providing valuable feedback on the progress and impact of the strategies to implement perinatal HIV prevention recommendations in different populations. For example, in North Carolina, of the identified children who were born after the State adopted the ZDV guidelines in 1994, 75 percent of their mothers used ZDV during pregnancy or at delivery. They further estimated that the risk for perinatal HIV transmission declined statewide from 21 percent in 1993 to 9 percent in 1994.

- *Birth Defects Prevention:* Each year, 2,500 to 3,000 infants are born with neural tube defects (NTD) caused by incomplete closing of the spine. A CDC study providing further evidence that folic acid (a B vitamin) prevents neural tube defects led to a USPHS recommendation that all women of reproductive age should consume 0.4 mg of folic acid daily. Recently, the FDA ruled that all enriched grain products include folic acid at the level of 140 mcg per 100 grams of grain.

- *Injury Prevention:* Head injuries are involved in 62 percent of bicycle-related deaths. CDC-funded research showed that bicycle helmets reduce the risk of head injury by 80 percent. Sixteen States now have statewide laws requiring use of helmets, and laws have been introduced or are pending in several others. In a joint Oregon-CDC evaluation it was shown that helmet use among children in Oregon went from 25 percent before the law to 49 percent afterward, and bicycle-related head injuries declined 47 percent for children under 10 years and 37 percent for children ages 10 to 15. In Georgia, the self-reported helmet use rate increased from 33 percent to 52 percent after the law took effect. This led to a new objective in Healthy Community 2000, urging all 50 States to pass such legislation.

  In another example, the potential for injuries associated with three-wheeled all-terrain vehicles (ATVs) was first identified by CDC researchers studying the problem in Alaska. Subsequently, the U.S. Consumer Product Safety Commission (in its role as a regulatory agency) reviewed the issue, determined that such vehicles were fundamentally unsafe, and banned their sale.

- *Lead Poisoning Prevention:* In consultation with EPA and CDC, ATSDR conducted a study of the national extent of child lead poisoning. A Federal ad hoc panel was established and nationally recognized experts in toxicology and epidemiology were convened to conduct and oversee the study. States, Federal agencies, and other organizations contributed data on the extent of childhood lead poisoning, effects of lead on children, and sources of exposure.

  The report was transmitted to the Congress, through HHS, and to the Committee to Coordinate Environmental Health and Related Programs for the purpose of coordinating research and public health recommendations contained in the report. A substantial re-examination, and lowering to 10 µg/dl, of the national standard for blood lead levels in children was conducted by CDC and implemented in a national public health initiative. ATSDR launched multiple studies to document lead exposure and adverse effects in children living near lead-contaminated sites.

In addition, CDC established the National Childhood Lead Surveillance database. Data from these data surveillance systems are being used to estimate the number of children with elevated blood lead levels, target resources, direct screening activities and assess the effectiveness of intervention efforts. The National Health and Nutritional Examination Survey (NHANES), conducted by CDC, demonstrated that from 1976 through 1991, the number of children ages 1 to 5 years with blood lead levels higher than 10 micrograms per deciliter decreased from 88 percent to about 9 percent, due in part to the removal of lead from gasoline. NHANES III data indicate where the remaining blood lead poisoning problem continues to be of major public health concern among urban, minority, and low-income children and are being used to target prevention efforts.

- *Youth Risk Behavior:* The Youth Risk Behavior Surveillance System (YRBSS) was developed to monitor priority health-risk behaviors that contribute to the leading causes of mortality, morbidity, and social problems among youth and adults in the United States. The YRBSS monitors six categories of behaviors: (1) behaviors that contribute to unintentional and intentional injuries; (2) tobacco use; (3) alcohol and other drug use; (4) sexual behaviors that contribute to unintended pregnancy and sexually transmitted disease, including HIV infection; (5) dietary behaviors; and (6) physical activity.

  Data from the YRBSS are being used to (1) monitor progress in achieving 26 national health objectives for the year 2000; (2) monitor progress in achieving 28 Healthy Community 2000 model standards; (3) monitor progress in achieving National Education Goal 7 — Safe, Disciplined, and Drug-Free Schools; (4) monitor progress in achieving measures of success for the American Cancer Society's comprehensive school health initiative; (5) focus school health education teacher training and instructional programs; and (6) support comprehensive school health programs nationwide.

- *Guidelines for Effective School Health Programs:* CDC is developing guidelines to assist school-policy and decision-makers, school personnel, and others in planning, implementing, and evaluating programs that address specific health-risk behavior priority areas. Over the last 2 decades, there has been a growing body of controlled trials showing that well-designed school health programs can lead to improvement in a variety of health behaviors. Development of these guidelines includes an exhaustive review of published research and exemplary practice as well as collaboration with academic experts and national, Federal, and voluntary organizations with an interest in child and adolescent health. The guidelines include specific recommendations to help States, districts, and schools implement health promotion programs and policies that have been found to be most effective in promoting healthy behaviors. Recommendations cover topics such as policy development, curriculum development and selection, instructional strategies, staff training, family and community involvement, evaluation, and linkages between different components of the comprehensive school health program.

- *Tobacco Control — Implementation of the Synar Rule:* The Synar rule, which implements Section 1926 of the Public Health Service Act, is putting research into prac-

tice, acting on the knowledge that about 3,000 young people under the age of 18 begin smoking every day and that 1,000 of them will eventually die of tobacco-related illnesses. The rule requires each State to have in place and to enforce state laws prohibiting the sale or distribution of tobacco products to individuals under the age of 18. Recent data from the Monitoring the Future Survey indicate significant increases in smoking among American youth. Limiting youth access to tobacco is one of many strategies necessary to reduce youth tobacco use.

In addition, research has shown that, in the past, state enforcement efforts to prevent access to tobacco by minors were limited. The Inspector General determined that in 1992 only 2 of the 50 States reported having statewide enforcement strategies. Strong state enforcement of tobacco access laws is a major component of a comprehensive approach to preventing tobacco use among youth, and the Synar rule requires such enforcement. Ultimately, the Synar rule takes the knowledge of youth consumption trends and applies it to reducing the supply of tobacco products to young people.

- *Tobacco Control — Implementation of Goals 2000: The Pro-Children Act:* Studies have shown that children exposed to secondhand smoke are more likely to have middle-ear disease, reduced lung function, and symptoms of respiratory irritation such as cough, phlegm, and wheeze. Exposures to secondhand smoke causes 150,000 to 300,000 lower respiratory tract infections in U.S. infants and children younger than 18 months, resulting in 7,500 to 15,000 hospitalizations a year. Exposure to secondhand smoke has also been directly linked to Sudden Infant Death Syndrome (SIDS), the major cause of death in infants between 1 month and 1 year of age. Such research helped educate the Congress about the health effects of secondhand smoke in infants, children, and youth and led to the Pro-Children Act, enacted in 1994.

  HHS worked collaboratively with the Department of Education (ED) and the Department of Agriculture (USDA) to implement the Pro-Children Act, which prohibits smoking in facilities (in some cases portions of facilities) in which certain Federally-funded children's services are provided on a routine or regular basis. The law applies to practically all elementary and secondary education and library facilities, day care centers, certain health care services to children, the WIC Program, and the Head Start program. Implementation of this law will prevent youth exposure to secondhand smoke outside the home in a variety of settings to help prevent the health effects of secondhand smoke that research has shown.

- *Preventing Youth Injuries from Paper Balers:* Because of the risk for severe injury or death associated with loading cardboard boxes into paper balers, Federal child labor law prohibited 16- and 17-year-old workers from performing this task. Recently the grocery industry lobbied to change this law on the basis that new safety features have been added to paper balers since 1954 when this legislation was passed. But questions still remained as to whether these safety features are present in all balers, and whether allowing youths to load balers that meet specific safety requirements could lead to youths loading balers that are not properly equipped. To assist in this policy debate,

CDC provided epidemiologic data on youth fatalities associated with paper balers; engineering evaluation data on machines in use; and hosted a meeting bringing together divergent perspectives. This information affected the paper baler legislation recently signed by President Clinton. The new law includes mandates that injuries or fatalities to minors resulting from contact with balers be reported to the Department of Labor (DoL). NIOSH is also providing technical assistance to the DoL in the development of materials for employers to help determine whether balers meet safety requirements mandated in the legislation, and in the collection of data on any resultant injuries.

Research-Services Linkages

- *School Health Education — Research to Classroom Project:* In the Research to Classroom Project, the CDC identifies curricula that have credible evidence of reducing health — risk behaviors among youth, and then ensures that the interventions, including training, are available nationwide for those interested in using them. However, CDC does not endorse curricula — schools decide what curricula best meet their students' needs. Identified curricula must have undergone evaluation against a control or comparison group. Findings must have included reductions in risk behaviors (not merely knowledge or attitude changes) at a follow-up measurement at least 4 weeks after the intervention. To be selected, a report of the evaluation study must have been published in a peer reviewed journal, and a set of external evaluation experts and a set of program experts must have determined that the findings were solid and that the intervention could be generally applied. Since the project was initiated in 1992, at least one person from 51 of 57 States and territories has been trained as a master trainer on one or more of the identified curricula, and more than 3,370 teachers have received training.

- *Occupational Injury Prevention — Hazard Alert on "Preventing Deaths and Injuries of Adolescent Workers":* Every year, approximately 70 youths are killed and another 64,000 require treatment in emergency rooms for work-related injuries. CDC published a Hazard Alert and a one-page fact sheet to inform employers, teens, their parents, teachers and other decision-makers of the risk for job injuries among adolescents. The fact sheet has been distributed to every high school principal in the United States, and has been inserted in some high school report cards and signed work permits, incorporated into occupational safety and health training and education in schools, and used as a training reference by employers of adolescents.

- *Occupational Injury Prevention — "Work Safe This Summer" Campaign:* In May 1996, Secretary of Labor Robert Reich launched a national campaign to promote safe employment of teenagers. This campaign features recommendations for reducing occupational injuries and NIOSH data describing the magnitude, patterns and risk of injuries to working children and adolescents.

- *Development of a Neurobehavioral Test Battery for Children:* A series of consultations was held with nationally recognized experts in pediatrics, child psychology, neuropsychology, neurotoxicology, and early education. A battery of screening

tests to assess neurobehavioral function in children as young as 1 year of age was field-tested and adopted. As a result, an operations manual, detailing ATSDR's Pediatric Environmental Neurobehavioral Test Battery was released in FY96 and made available for studies of children, ranging from 1 through 16 years of age, who may be exposed to neurotoxic substances in the environment.

Consumer Product Safety Commission

- *Preventing Infant Suffocation:* In late 1990, several infant deaths were associated with the use of infant bean bag cushions. Most of the infants who died on the infant cushions had been diagnosed as having SIDS, although they were found with their faces buried straight down into a product that molded around their heads. Medical experts in SIDS at St. Louis University tested the cushions and concluded that the deaths were likely due to rebreathing of lethal levels of carbon dioxide (CO_2) trapped in the infant cushions. The CPSC worked with manufacturers to recall infant bean bag cushions in early 1991 and banned them in June 1992. There were 35 infant deaths associated with these cushions.

  Further research into SIDS deaths by CPSC staff showed that rebreathing CO_2 trapped in soft bedding may contribute to the deaths of as many as 30 percent of the infants initially diagnosed as having SIDS. Study results showed that infants who died with their nose and mouth covered by soft bedding were more likely to be sleeping on their stomachs on top of pillows, comforters, and other soft bedding. CPSC worked with the American Academy of Pediatrics, the National Institute of Child Health and Human Development, and the SIDS Alliance to promote side and back sleeping positions for infants, and to warn against the dangers of soft bedding.

- *Child-Resistant Packaging:* For more than 2 decades, CPSC has enforced the Poison Prevention Packaging Act (PPPA) that requires child-resistant packaging for various drugs and household products. A CPSC economist recently published an article in JAMA that underlined the importance of child-resistant packaging. He calculated that the death rate from poisonings by drugs and household products dropped by 45 percent since 1974. This translates into 460 lives saved from 1974 to 1992.

  To address the poisonings that still occur, last year, CPSC revised the regulations to ensure that the packaging is both child-resistant and "adult-friendly." This is accomplished by testing the packaging with both children under age 5 and with adults ages 50 to 70. The new packaging is already on the market and will continue to be phased in over the next year-and-a-half. It is hoped that if packaging is easier to use, adults will not defeat the child resistant packaging, leave the packages open, or request non child-resistant packaging.

- *Baby Walkers:* Baby walkers account for more injuries annually for young children than any other nursery product. About 25,500 children under 17 months of age are treated each year in hospital emergency rooms for walker-related injuries. A recent CPSC study indicated that 83 percent of the incidents involve children falling down stairs or between levels in baby walkers. CPSC worked with ASTM,

a voluntary standards organization, to develop a voluntary performance requirement that would result in modified designs of baby walkers. These new baby walkers will have to stop on a top step or be too large to fit through a basement doorway. The final voluntary requirement, expected to be published by the end of 1996, could result in substantial reductions in the number of walker-related injuries.

- *Child-Resistant Cigarette Lighters:* Each year, an estimated average of 150 deaths, 1,100 injuries, and 5,600 residential structure fires have resulted from children under age 5 playing with cigarette lighters. CPSC worked cooperatively with industry to develop a test method that evaluates the ability of children under 5 years old to operate disposable lighters. With industry support, CPSC passed a mandatory rule, effective in 1994, that required that most lighters be child resistant. This should result in fewer deaths, injuries and residential fires.

- *Lead in Miniblinds:* Childhood poisoning from lead is still a problem. Approximately 0.9 million children between the ages of 1 and 5 continue to have blood lead levels that are of concern. In children, lead poisoning can cause irreversible brain damage, delay mental and physical growth, and cause behavior and learning problems.

  Because consumers cannot determine the amount of lead in the dust on their blinds, CPSC recently advised parents with young children to remove these vinyl miniblinds from their homes. CPSC also asked the Window Covering Safety Council, which represents the industry, to immediately change the way it produces vinyl miniblinds by removing the added lead. Manufacturers have agreed, and new miniblinds without added lead are now available in stores.

- *Window Pull-cords and Strangulations:* Since 1981, over 180 cases in which children have been strangled by window cords have been reported, or about 1 death per month. In about half these cases, children between 8 months and 4 years old were found hanging in the loop of the cords. In other cases, children were found with pull-cords wrapped around their necks. The younger children who died, usually between 8 and 23 months old, were often in cribs that were placed near the window cords. The older children, typically between two-and-a-half and 4 years old, usually strangled in cords when they climbed on furniture near windows.

  CPSC met with the industry Window Covering Safety Council to find ways to remove this hazard. Manufacturers have now eliminated the loop on all new two-corded horizontal blinds. In addition, CPSC is working with industry to develop a voluntary standard for window covering pull-cords that will address this hazard.

- *Drawstrings on Children's Clothing:* Since 1985, CPSC has received reports of 17 deaths and 42 non-fatal incidents caused by drawstrings from the hoods and necks of children's jackets catching on such things as playground equipment and cribs. CPSC worked with children's clothing manufacturers to address this issue. Within months, the industry voluntarily agreed to redesign children's sweatshirts and jackets without the hazardous drawstrings at the hoods and necks. Today, most of this type of children's clothing in this country is sold without drawstrings.

- *Bike Helmets:* Each year about 300 children are killed and 400,000 go to hospital emergency rooms because of bike-related incidents. Many of these injuries, and most of the serious ones, are to the head. Helmets can reduce the risk of head injury by up to 85 percent. CPSC is working on a new standard for bike helmets.

- *Playgrounds:* Each year, about 200,000 children are injured seriously enough on playgrounds to go to hospital emergency rooms. About 20,000 children under age 5 go to hospital emergency rooms for home playground injuries. About another 35,000 children under age 5 go to hospital emergency rooms for public playground injuries. CPSC has worked with industry on voluntary safety standards for both home and public playground equipment.

  CPSC has also published a "Handbook for Public Playground Safety" that includes guidelines for safe playgrounds. Among other measures, CPSC emphasizes the need for protective surfaces for playgrounds. Such surfaces can break the falls that account for up to 75 percent of playground injuries to children.

National Highway Traffic Safety Administration

Motor vehicle crashes are the leading cause of death for every age 5-27. Below are several illustrations of how research conducted under the auspices of the National Highway Traffic Safety Administration (NHTSA) has influenced and directed policy decisions and service delivery.

Research-Policy Linkages

- *Federal Motor Vehicle Safety Standard for Child Safety Seats:* NHTSA's child safety program is focused on protecting children under age 5 from injuries in motor vehicle crashes. Child safety seats are used to transport children in vehicles. Early laboratory research with dummies in sleds identified the characteristics of a safe child seat. The results of this research led to the implementation of Federal Motor Vehicle Safety Standard (FMVSS) 213 which sets forth the requirements manufacturers must follow for child restraint systems used in motor vehicles and aircraft. As a result, child safety seats have been effective in reducing injury to children.

- *Children and Air Bags:* While air bags are effective for adults and saved almost 500 lives in 1996 alone, the story is very different for children. To date, 32 children have suffered fatal injuries due to the activated passenger air bag. NHTSA required air bag warnings to be placed on the automobile visor; however, research showed that these warning labels were not noticed or understood. Focus group research provided information on effective warning labels (e.g., size, color, location, message) that parents would notice and read. This information was incorporated into a rule which will require manufacturers to install the new labels starting in May 1997. Other rulemaking is also under way to reduce airbags' power by 20 to 35 percent which will reduce the risk of airbag injury to children. These improvements are being made through changes to Federal airbag requirements (FMVSS 208).

- *Zero Tolerance:* Research has shown that zero tolerance laws reduce single vehicle nighttime fatal crashes among drivers under the age of 21. A "zero tolerance" law sets a blood alcohol concentration (BAC) level of .02 or less for drivers under age 21. Such laws are called zero tolerance because a driver is likely to exceed a .02

BAC limit after only one beer or other alcoholic drink. These research results were influential in the passage of zero tolerance laws in 37 States and the District of Columbia. They also were influential in the enactment of a Federal zero tolerance requirement in the National Highway System Designation Act of 1995. Under this law, States without a zero tolerance law will lose highway construction funds.

- *Model Ice Cream Vendor Ordinance:* In the early 1970s, NHTSA noticed that considerable casualties occurred around ice cream vending trucks. NHTSA conducted research to determine how best to address this problem. The research resulted in a model ice cream vendor ordinance which stipulated that those vehicles bear specific markings and signage and that they use certain routes. Subsequent testing showed these interventions to be highly effective.

Research-Services Linkages

- *Better Targeted Programs:* Data show that young male pickup truck drivers have low safety belt usage. Recent research has provided information on effective messages and delivery mechanisms to reach this audience. Results from the research have been incorporated into public information and education materials targeted at young male pickup truck drivers.

- *Enforcement of Underage Impaired Driving Laws:* Data indicated that the rates at which young drivers were being arrested for driving under the influence (DUI) of alcohol were far lower than the involvement of young drivers in alcohol-related crashes. Subsequent research then showed that DUI enforcement patrol tactics targeted adult drinking drivers, and overlooked young drivers, where drinking and driving patterns differed from those of adults. Training was initiated to inform police officers of the differences in youth drinking and driving behavior and to provide guidance on changing patrol tactics to apprehend youthful drinking drivers.

National Institutes of Health — National Institute of Environmental Health Sciences (NIEHS)

- *Air Pollution:* NIEHS funded long-term studies on effects of air pollution on human health that showed an association between chronic exposure to acid aerosols and respiratory symptoms in children. These findings have been pivotal in development of EPA guidelines for sulfur dioxide and particulate matter emissions.

- *PCBs:* NIEHS research has shown that nursing infants are exposed to PCBs via their mother's milk and that children and mothers can be exposed to PCBs from eating fish that have accumulated PCBs in their tissues. Based on this research, California health laws have defined PCBs as a reproductive health hazard, and New York has issued health advisories for nursing mothers who consume contaminated fish.

- *Children's Environmental Health Network:* NIEHS is one of several governmental agencies that supports the Children's Environmental Health Network. This effort has helped to establish an infrastructure to communicate environmental health policy, research and education among the network's governmental and non-governmental organizations.

National Institutes of Heath — National Institute of Child Health and Human Development (NICHD)

- *The NICHD Family and Child Well-Being Research Network:* NICHD established this multi-disciplinary network to enable researchers to do policy-relevant research and to collaborate directly with policy researchers. There are several examples of how the Network has empowered the university research community to act proactively and engage in a policy-relevant project.

  The Network has published a paper on new indicators of family and child well-being and co-sponsored a conference with the Institute for Research on Poverty (University of Wisconsin) to examine the state-of-the-art regarding welfare reform. This conference was held at NIH and led to the ASPE report on child well-being. The Network also budgeted resources to help the work of the Interagency Federal Forum on Child and Family Statistics, which has put together a short list of the most important indicators of child well-being that are under consideration for formal recognition as an authoritative series of government indicators.

  The Network also worked with the Census Bureau for 3 years to design the Survey of Program Dynamics (SPD). The Network enabled the scientific community to invest resources into the SPD design, which has enhanced the study's credibility. As a result, the new welfare legislation funds the SPD for 6 years, making it an important national source of data for evaluating welfare reform.

  The Network has enabled researchers to undertake other similar projects useful to the policy arms of Government and led to a good working relationship with ASPE and the Administration for Children and Families (ACF) of HHS to help address issues related to welfare reform. ASPE and ACF have now joined forces with the Network to develop better indicators of family and child well-being and to help design state-based evaluations of welfare reform that can work in harmony with the SPD.

- *Learning Disability:* Children who do not learn to read constitute approximately 17 percent of the population and comprise over 50 percent of the special education population. Thirty-five percent of children with learning disabilities in reading drop out of school, a rate twice that of their classmates. Further, at least half of juvenile delinquents manifest some type of learning disability. In response to the significant deleterious impact that learning disabilities have on the development of the child, NICHD supported research to develop a diagnostic battery of assessment measures that predict children's reading performance. On the basis of these predictions, several NICHD prevention and early intervention sites are now under way and have demonstrated that reading disability can be prevented if intense and direct interventions take place in kindergarten and first grade. These findings were underscored by other NICHD research showing that 75 percent of learning disabled children who are not identified and provided with intervention by age 9 will remain disabled through high school. These findings have been presented to the White House Interagency Committee on Learning Disabilities (an arm of the Domestic Policy Council).

- *Child Support:* NICHD has used USDA data to create family equivalence scales that, in turn, result in child support schedules. NICHD researchers have explored which types of people pay child support, how custody affects child support, and the role child support plays in children's well-being.

- *Adolescent Health:* NICHD, with funding from 10 NIH program offices and components and other Public Health Services agencies, is conducting the National Longitudinal Study of Adolescent Health. The goal of the study is to better understand the factors that promote good health among young people and to explore those factors that place youth at risk. Data is being shared with researchers, program planners, parents, educators, and health care providers across the country.

Office of National Drug Control Policy (ONDCP)

- *Alcohol and Drug Use:* Surveys and other research by Federal agencies and private organizations provide convincing evidence that early first use of alcohol or tobacco is strongly correlated with later use of illegal substances. Children who smoke cigarettes are 12 times more likely to use marijuana and 19 times more likely to use cocaine.

  Such knowledge has been instrumental in shaping numerous Federal policies and programs. Many substance abuse prevention strategies are now oriented toward elementary and middle school youth. The research has been cited in testimony, budget justifications, and public information and educational initiatives.

- *Link Between Drugs and Violence:* Understanding of the strong link between drugs and violence was a major impetus for modifying the Drug Free Schools and Communities Act to the Safe and Drug-Free Schools and Communities Act (Title IV).

- *Drug Data Evaluation and Interagency Coordination Working Group:* ONDCP is also part of a Drug Data Evaluation and Interagency Coordination Working Group that includes representatives from about 20 Federal departments and agencies involved with drug issues. During its first year, the Subcommittee developed an inventory of drug-related information systems and data sets; produced a report, Federal Drug-Related Data Needs Assessment; and consulted with public- and private-sector drug research experts concerning drug data and policy issues.

U.S. Department of Agriculture

USDA is the Federal Government's lead agency for human nutrition research, and is responsible for assuring and monitoring the nutritional health of all Americans through nutrition research. The Agricultural Research Service (ARS) in the Research, Education, and Economics (REE) mission area of USDA conducts an integrated program of human nutrition research that provides a vital link to the interdisciplinary food and agricultural sciences programs of REE agencies. The ARS has six Human Nutrition Research Centers nationwide, staffed by a cadre of renowned scientists with expertise in nutrition, in areas that cover the spectrum of the human life cycle. Two of these centers are targeted to research on the specific needs of children: the Children's Nutrition Research Center in Houston, Texas, and the Arkansas Children's Nutrition Research Center in Little Rock.

The ARS also serves as the USDA leader and liaison for the mandatory review every 5 years of the Dietary Guidelines for Americans, the Federal policy document for all nutrition information and education materials produced by the Federal Government. ARS research is critical to the development of these guidelines. ARS also conducts nationwide surveys of food consumption by Americans, the data from which are used to support development of food and nutrition policies within USDA. Food consumption data is also used by other Federal agencies that form policy. These agencies include EPA and HHS.

USDA relies heavily on scientific research to formulate policy related to providing Americans with a healthful and abundant food supply; in other words, research affects USDA's food and nutrition policies. In December 1994, the Center for Nutrition Policy and Promotion (CNPP) was created to facilitate the link between research and the dietary and socioeconomic needs of the consumer. CNPP has used research in the following ways:

- *Research on food and nutrient consumption helped determine which foods must be fortified with folate to prevent birth defects.* It published the Dietary Guidelines for Americans every 5 years to promote healthful diet for individuals over the age of 2 years.

- *Research on the cost of raising children is used to publish an annual report, "Expenditure on Children by Families," that estimates food and other expenditures incurred by parents of different economic levels.* States use this report to help establish child support guidelines and foster care payments. These guidelines affect millions of youngsters involved in child custody and support cases.

- *Research on how maternal nutrition affects the health of infants can have a direct impact on nutritional policies for pregnant women in economically vulnerable groups.*

Research related to food assistance and other nutrition programs also results in policy evaluation, often leading to much-needed improvements. For example, CNPP is responsible for the development of USDA food plans, including the Thrifty Food Plan (TFP), which serves as the nutritional basis for Food Stamp benefit level. TFP specifies quantities of different types of food that households may use to provide nutritious meals and snacks at relatively low cost. State-of-the-art nutrition and economic modeling is used periodically to revise the TFP, which affects millions of American adults and their children.

U.S. Department of Education

Research-Services Linkages

- *Success for All: Building on Research to Improve Learning:* One of the best known programs for whole school reform is Success for All, a comprehensive school-wide restructuring program designed to ensure that all children are successful in basic skills, particularly reading, the first time they are taught. Success for All draws from research to determine effective ways of improving reading and writing instruction, building family support for education, and helping teachers and other staff members implement the program. Components of the instructional program include one-on-one tutoring by certified teachers; regular assessments to determine whether students are making adequate progress and to suggest alternative teaching strategies; and an early reading program that

BEST COPY AVAILABLE

uses regular storybooks supported by careful instruction that focuses on phonetic awareness, auditory discrimination, and sound-blending.

Success for All programs are being implemented in 28 States across the Nation. In Houston, Texas, the program is being "scaled up" to 74 elementary schools. Implementation funds come from the Texas Education Agency, with the district and participating schools providing continuing support primarily through reallocation of Title I and special education resources.

- *Family Connections — A Tool for Parent Involvement in the Education of Young Children:* Research has repeatedly shown that parent involvement is critical to children's learning. The Appalachia Educational Laboratory built on the research base to develop practical ways of increasing parental involvement to support young children's reading. A series of 30 four-page weekly guides for home use includes messages to parents on reading aloud, effective discipline strategies, learning through play, and appropriate learning activities for parents and other family members to do with young children. The series was first tested in Kentucky in 1992 and subsequently used in Virginia, West Virginia, Mississippi, Oklahoma, New York, and Tennessee.

- *Teaching Cases: New Approaches to the Pedagogy of Teacher Education and Staff Development:* The Far West Laboratory for Educational Research and Development has drawn on the work of Bruner, Resnick, Sprio, Shone and others to develop case-based approaches for teacher preparation and staff development that connect general principles with the demands of real-world educational situations. Approaches include case analysis, case writing, and case discussion that help teachers develop new skills, deepen their knowledge of subject matter, and acquire needed sensitivities to children of diverse backgrounds and cultures.

- *Center for Research on Teacher Learning:* Research findings resulting from work at the Center for Research on Teacher Learning are providing a framework for Kentucky's school reform (KERA) relating to teacher development. In order for the goals of KERA to be realized, it became obvious that teachers must be supported as they learn new teaching practices and assume new roles in school governance. The research of the Center is being applied to the policy and budgetary decisions about what teachers need in order to help students meet the State's new learning goals. Understanding of what is required in making significant change go as far beyond surface and trivial teacher workshops for new strategies. Researchers are partners with policymakers and practitioners in identifying and, it is hoped, implementing the conditions for successful reform.

Office of Special Education Programs (OSEP)

Over time, researchers have demonstrated not only how to assess the progress of individual students, but also how to analyze each student's learning environment (e.g., factors at school, in the home, and in the community) that can significantly influence educational outcomes. These and other advances in research have contributed to development and validation of innovative approaches to education that result in

improved learning and increased independence among infants, toddlers, children, and youth with disabilities.

Research-Policy Linkages

- *Pre-referral Services Projects:* Projects such as those conducted by OSEP researcher Tanis Bryan (University of Illinois-Chicago) have helped schools reduce the number of children referred to special education programs and services. Local schools using pre-referral services form collaborative teams of special educators and general educators. Team members identify, observe, and assess children who are experiencing difficulty learning in their general education classrooms. The team then develops and implements alternative instructional strategies that seek to address each child's individual academic and social problems. Teachers employ these strategies with the child in general education classrooms — before (not after) referral to special education becomes necessary. Pilot pre-referral services projects have reduced rates of special education referrals by 30-50 percent in three States (California, Kansas, and North Carolina). Based on these positive results, pre-referral services are now required in 27 States.

- *Transition Services Projects:* Projects such as those conducted by OSEP researcher Philip Ferguson (University of Oregon), help prepare youths with disabilities for employment after high school. In the 1980s, OSEP transition projects provided States and localities with information about effective transition programs. For example, OSEP researchers have shown that the key features of successful programs include (a) involving the students themselves in making choices about their own post-school jobs, (b) providing opportunities for work and "on-the-job" experience while the students are in high school, and creating local networks of families, peers, and employers who can provide ongoing support after the students finish high school. States and localities are currently using these proven practices to plan for successful transitions for all youth with disabilities. Transition plans for students with disabilities, many of which are modeled after proven practices, are now required in each of the 50 States.

- *Early Identification Projects:* Projects such as those conducted by OSEP researcher Keith Scott (University of Miami), have demonstrated proven techniques to determine which children need early intervention. Early identification is a continuous process that involves (a) screening children to identify who to refer for additional evaluation and (b) clinically assessing referred children to identify their individual needs for services. OSEP research shows that these procedures are effective in identifying not only infants and toddlers with severe disabilities but also young children at risk for developmental delays. These techniques are widely used, as shown by the fact that "child find" systems for early identification are now required in each of the 50 States.

- *Family-Based Services Projects:* Projects such as those conducted by OSEP researchers Carl Dunst (Allegheny-Singer Research Institute, Pittsburgh, Pennsylvania), demonstrate proven strategies to empower parents to actively support their child's growth and development. OSEP-funded research suggests not only the importance of family involvement but also effective strategies for working with families of young children with disabilities. For example, when a young child

needs services from different local agencies, it is often necessary to help families learn how to assess and effectively coordinate the delivery of these services. Individual Family Service Plans, many of which reflect these proven practices, are now required for all young children with disabilities who receive Federally supported early-intervention programs and services.

Research-Services Linkages

- *Curriculum-Based Measurement (CBM) Projects:* Projects such as those conducted by OSEP researchers Lynn and Douglas Fuchs (Vanderbilt University), help teachers learn how to adjust their instruction to improve educational outcomes for students with learning disabilities. Teachers using CBM ask their students to answer questions that assess their comprehension of a short passage in reading or their skill at solving word problems in mathematics; the tests are administered on a weekly or semi-monthly basis throughout the school year. OSEP-funded research demonstrates how teachers can use CBM results to identify students who would benefit from more time to complete their assignments or from cooperative reviews of their lessons with peers. These proven practices are changing how children with disabilities are assessed all across the country. Title I programs in Nashville Public Schools have adopted this practice. State Education Agencies are using CBM practices in Colorado, Iowa, Kansas, and Nebraska. In addition, Local Education Agencies are using this practice in California, Illinois, Kansas, Iowa, Minnesota, Nebraska, Oregon, and Tennessee.

- *Critical Thinking Skills Projects:* Projects such as those conducted by OSEP researcher Donald Deshler (University of Kansas), have helped middle school and high school students with learning disabilities develop the complex learning strategies needed for tomorrow's jobs. For example, one set of proven strategies has helped students improve their writing skills. The strategies provide "helpful hints" and other guidelines for identifying a stimulating theme for a composition, writing clearly worded sentences that elaborate upon the theme, organizing these sentences into coherent paragraphs, and systematically checking the composition for errors. OSEP researchers found that not only did the performance of students increase dramatically after they learned these strategies, but also that outside reviewers rated the students' written products more highly, on average, than those of their non-disabled peers. Today, these proven practices are widely used, having been disseminated through a national network of teachers and teacher-trainers. This network, which is based at the universities in four States (Arizona, Alabama, Kansas, and Pennsylvania), has provided information to more than 75,000 teachers in 1,200 school districts in 26 States across the country.

- *Anchored Instruction Techniques:*[1] Techniques such as those demonstrated by OSEP researchers Ted Hasselbring (Vanderbilt University), Ralph Ferretti (University of Delaware), and John Woodward (University of Puget Sound). Teachers using anchored instruction techniques ask their students to view video and animated adventures on CD-ROM

[1] *See also: Fox, J. (March 1990). The Impact of Research on Education Policy, Office of Research, Office of Educational Research and Improvement, U.S. Department of Education, Working Paper OR 90-522.*

discs. The teachers then use these adventures to organize a series of interrelated lessons around a common topic. The lessons help students learn to select a challenging topic, discover what it means, and then communicate this information to their peers, other teachers, and their families. As a result, students with learning disabilities are excelling in math, reading, and social studies. OSEP-funded research shows that teachers' use of this proven practice can help thousands of students with disabilities, at all skill levels, to access new information and excel in reading, mathematics, and social science. These CD-ROM discs are commercially distributed through state distribution centers.

U.S. Department of Health and Human Services, Administration for Children and Families

- *SIME/DIME Negative Income Tax Experiments:* Results of these experiments suggested that provision of cash assistance to two-parent families had destabilizing family impacts, and helped lead to the downfall of welfare reform legislation in the late 1970s.

- *Welfare-to-Work Demonstration Projects:* Projects, evaluated by the Manpower Demonstration Research Corporation, were very influential in the development of the Family Support Act of 1988, particularly the JOBS program.

- *The Ohio Learning, Earning and Parenting (LEAP) Program:* Positive findings on school attendance and enrollment from the LEAP program led to President Clinton's recent executive action on school requirements for teen parents.

Other research has also been influential, but in different ways the Bane and Ellwood studies of welfare dynamics in the 1980s, for instance, provided a much greater understanding of the welfare caseload. This research was used to develop targeting strategies.

One of the best examples of research-services linkages is the Families and Schools Together (FAST) project. FAST is a collaborative prevention project for elementary school children who are at-risk for school failure, juvenile delinquency, and substance abuse in adolescence. The collaboration involves schools, nonprofit mental health services, education and assessment agencies for substance abuse, and families. The following convey a sense of how FAST research and development results are facilitating more effective service delivery and informing public policy decision-making:

- FAST is being taken to scale in Madison, Wisconsin. Over the next 3 years, FAST will be expanded to every school in the city. A broadly representative group of public and private organizations and businesses will provide funding.

- Both Head Start-FAST and middle school-FAST have been replicated in three other States. FAST sites include Racine and Kenosha, Wisconsin, Des Moines, Iowa, and Baltimore, Maryland.

- The FAST elementary school program has been replicated in 26 States and Canada, with funding from the DeWitt Wallace Reader's Digest Fund. There are now almost 200 certified FAST trainers. FAST has achieved substantial cross-cultural and cross-language success.

- Both California (under a Juvenile Crime Prevention Initiative) and Wisconsin (under the Anti-Drug bill) have included FAST in their state budgets for $1 million a year for 5 years or more.

- The National Institute of Drug Abuse is reportedly on the verge of approving a request for a $3 million intensive, long-term evaluation of FAST.

- CNN recently reported on FAST programs in Florida and Georgia. FAST has received awards from the United Way of America, Harvard/Ford Foundation, and the Family Resource Coalition.

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (ASPE)

- *Institute for Research on Poverty:* For almost 30 years, ASPE has supported the Institute for Research on Poverty, a national, university-based center for research on the nature, causes, and consequences of poverty and social inequity in the United States. The Institute sponsors the original research of its members and dissemination of their findings. Its work has consistently been multidisciplinary, pooling research interest and knowledge across the major fields of social science. The Institute's research has advanced the link between science and policy related to welfare reform proposals, assessment of training and employment programs for young people, investigations of groups at high risk of poverty (e.g., the homeless,' the disabled, and single parent families), and monitoring of demographic behavior.

  Here are just two examples of how the Institute is helping to bridge the gap between the research, policy, and services realms:

  – The economically vulnerable state of many single-parent families led Institute researchers to propose, in 1982, the Wisconsin Child Support Assurance System, an alternative to Aid to Families with Dependent Children (AFDC) for custodial parents with child support orders. Three components of this recommendation became law with the passage of the national Family Support Act of 1988.

  – In February 1996, the Institute presented a conference on "The New Federalism: Monitoring Consequences" to enable researchers and other analysts to share information about what they were doing in response to the emergence of new programs and policies affecting children and families and to discuss the coordination of efforts to monitor, evaluate, and respond to those changes.

Abstract

The Children's Initiative Subcommittee was formed by the National Science and Technology Council (NSTC) Committees on Fundamental Science and Health, Safety, and Food. The Subcommittee was charged to explore the Federal investment in research focused on the biological, cognitive, and social development of America's children. *Investing in Our Future: A National Research Initiative for America's Children in the 21st Century* recommends interrelated research themes requiring multidisciplinary approaches to fill important knowledge needs. These include: (1) a children's health research initiative to understand how chronic health problems that emerge in later life can be better prevented; (2) a research effort to develop public health guidelines regarding environmental health and safety risks to children; (3) a cognitive development research initiative to understand how children learn and expand their mental capacities by interacting with new technologies and how such technologies can be better designed to promote learning among children; (4) a research effort to better understand what factors influence children and adolescents to avoid or engage in risky or adverse behaviors (e.g., smoking, drug abuse, teen pregnancy); (5) long-term follow-up studies of children; and (6) policy research issues on the effects of health care and welfare reform on children. A recommendation was made to initiate a formal interagency working group led by the Domestic Policy Council (DPC) and NSTC to conduct a state-of-the-art assessment of health and social priorities relevant to children's and youth's well-being, including data quality and their scientific underpinnings.

A recommendation was also made to establish stronger links among researchers, policymakers, and service providers so that the policies and programs that are developed better meet the needs of children and adolescents.

For Further Information Contact:

Office of Science and Technology Policy
Executive Office of the President
Washington, D.C. 20502
Telephone: (202) 456-6130
Fax: (202) 456-6027

Available on the NSTC Home Page via link from the OSTP Home Page at:

http://www.whitehouse.gov/WH/EOP/OSTP/html/OSTP_Home.html

For additional paper copies, please fax your request to:

Science Division, Office of Science and Technology Policy
Fax: (202) 456-6027

BEST COPY AVAILABLE

BEST COPY AVAILABLE